THE EFFECTS OF VISUAL AND AUDITORY MEMORY ABILITIES ON WORD RECOGNITION SUCCESS UNDER TWO TEACHING METHODS

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PREFACE

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To her, this study is most sincerely dedicated.

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CHAPTER I

THE RESEARCH PROBLEM

Introduction

As Chall (1967) has pointed out in her extensive review of the problem, there yet remains considerable disagreement as to the best way to teach a young child to read. Despite the fact that reading is the most widely researched academic school subject, the issues of the right age for beginning reading, the advantages and disadvantages of the look-say, phonetic, linguistic, and language experience approaches remain controversial topics among educators concerned with the growth and development of reading skills. Further evidence of the complexity of the the factors involved in beginning reading instruction is provided by the findings of the extensive U.S.O.E. First Grade Studies (1966). Bond and Dykstra (1967) in assessing the data from these studies concluded that they have found no one approach so distinctly better in all situations and respects than the others that it should be considered the one best method or to be used exclusively.

Along with the problem of identifying effective methods of teaching reading, considerable disagreement also exists among researchers regarding the etiology and remediation of children who have already failed in reading as Natchez's (1968) volume of reading problems has indicated. The necessity of accounting for individual differences in reading success has fostered extensive theory and research but few valid

generalizations have emerged. Most researchers acknowledge that reading failure is the result of a complex interaction of physical deficits, environmental inadequacies, cognitive limitations, emotional disorders, and perceptual weaknesses. However, the particular importance of perceptual influences on reading success in the early primary grades has been established in studies by Anderson, et al. (1967), Birch and Belmont (1965), Budoff and Quinlan (1964), and Harrington and Durrell (1955) among others. These studies have shown that perceptual factors tended to correlate much higher with beginning reading success than has been the case with chronological age, mental age, intelligence, or other background factors such as culture or desire to read. Although there still remains considerable disagreement as to the specific effects of perceptual factors in beginning reading achievement, there appears to be general agreement as to their importance to early reading success.

If perceptual factors can be assumed to play a critical role in early reading success, they would seem to hold many implications for the individualization of reading instruction at the primary levels. The specific perceptual processes that facilitate acquisition of beginning reading skills have received increased attention in recent years. However, the particular teaching methods that increase the likelihood of success for children with specific perceptual strengths and weaknesses have not been clearly identified through research studies. The following section on "modality differences" in learning effectiveness discusses the emerging interest in matching learner characteristics with teaching methods in beginning reading which constitutes the general focus of this study.

Nature of the Problem

The concept of "modality differences" in learning, which has received considerable attention in recent years in reading research, actually has a longer history than would seem likely in view of its present status.

Freud (1953), in his reference to Charcot's views on aphasia, referred to the "modality concept" when he reported that Charcot had suggested as long as one hundred years ago that individuals differ in their reliance upon given perceptual modalities for the behaviors of reading, writing, and speaking. Charcot also indicated that these reliances might be either visual or auditory impressions or kinesthetic associations. From these modality preferences, Charcot inferred the existence of a special strength for receiving and interpreting stimuli through a particular pathway.

Denison (1969) in discussing the history of this concept reported that Galton in 1883 did research on the prevalence of visual imagery when thought processes were popularly felt to include "mental imagery" of some sort. Galton apparently found that some people did possess exceptional visual imagery systems in that they attended to the visual equivalent rather than the sound of spoken words and that this could not be attributed to keen sight or a tendency to dream.

Early in the present century, Binet (1912) discussed differences in imagery systems and, with due credit to Charcot, he suggested a natural inequality in the different forms of imagery used in memory and thought. Binet went beyond Charcot's trichotomy of visual, auditory, and kinesthetic to include an "indifferent" type of individual in terms of modality preference.

Educational and psychological theory as well as research today still emphasizes this idea of specialized proclivities for learning via different modalities.

Wepman (1964, p. 31) suggested that differences in the critical factors relating to reading do exist at the perceptual level and that the modality concept is most concerned with psycholinguistic skills which provide the foundation for integrative and comprehension abilities. Wepman stated that:

> Individual differences in perceptual transmission and conceptual learning can be demonstrated to be along modality lines; methods for teachers or the school system to determine a given child's normal learning, if they are inclined to do so, remain to be discovered.

Both Harris (1964) and de Hirsch, et al. (1966) reported evidence that suggests the possibility of dominant learning modalities, and they indicated that such perceptual styles should be taken advantage of by using instructional methods that are adapted to the learner's particular strengths in perception, imagery, and recall.

In emphasizing this point de Hirsch, et al. (1966, p. 82) stated: "We feel that exploration of modality strength and weakness is of more than theoretical interest and should largely determine teaching methods."

In this same passage, they further stated that:

> In our opinion, therefore, one method of teaching cannot be favored over another as a matter of principle. Most discussions on the subject seem to miss this point. Approaches to teaching should depend on the individual child's strengths and weaknesses in the different modalities.

Robinson (1966, p. 8) in discussing the experimental evidence for beginning reading plans, stated:

> In the past we have attempted to adjust pupils to a single plan for learning to read. This attempt has not been entirely successful. It appears to me, therefore, that a penetrating

> analysis of the attributes of children and the demands of reading plans may eventually enable us to select the best ones for particular groups of children. Many studies are needed to discover the full advantages of a variety of approaches to beginning reading.

In a similar way, Strang (1968, p. 157) emphasized the importance of the modality concept in her discussion of the trends, needs, and future directions in reading:

> Some attention is being increasingly given to ascertaining the individual's preferred avenues of learning. Research has shown that some individuals on different age levels prefer the whole versus the part approach; others the auditory versus the visual and vice versa. It is recommended that the teacher recognize these different modalities and use the methods by which individual children learn most readily. At the same time, it may be possible to strengthen the modality in which they are weak.

Frostig (1969, p. 574) also recommended that consideration be given to the choice of teaching methods in beginning reading which takes into account each child's specific strengths and weaknesses. In arguing for the necessity of a "match" between reading and developmental abilities, she concluded:

> Our knowledge will not be advanced by arguing about the degree to which visual perception is related to reading. A more fruitful approach is to explore the cognitive and other abilities of an individual and relate them to different task processes at various stages of development and performance, so that an educator can choose the optimum method to help a particular child learn a particular task.

In a recent book, Dechant (1970, p. 235) raised questions that are essentially the same questions that the present study will investigate. In summarizing research on teaching methods, he stated:

> In general, research and experience have shown that an analytical or whole-word approach has worked with most children. They have, however, also shown with the same degree of validity and reliability that the analytic method has not worked with all children and that the synthetic method has worked with some children. No one method has been found to be equally satisfactory in all classrooms with all pupils.

> The task facing teachers and psychologists today is that of identifying the pupil who learns best with either one or the other method. Who is the pupil who would best be introduced to reading through an analytic approach?

Although Dechant aptly summarized the concerns of the previously cited authorities and raised and discussed several critical questions relating to beginning reading discussion, he has not suggested what specific characteristics of children might enable them to learn more effectively by one particular method. An increasing amount of research deriving from both basic research in reading processes and applied research involving clinical reading disabilities cases has suggested that many children who fail in reading have deficiencies in what is termed "automatic" or "associational" cognitive and perceptual processes of an integrational nature. The following section discusses the theoretical nature of these processes and their relationship to this study.

Theoretical Approach to the Problem

The Illinois Test of Psycholinguistic Abilities (ITPA) was originally designed by McCarthy and Kirk (1961) as a diagnostic test of psychological and linguistic functioning. Its goal was to provide a profile of a child's psycholinguistic abilities and disabilities in order that remediation could follow in deficient areas of functioning. The theoretical rationale for the design of the test was Osgood's (1957) formulation or model for the communication process which was based on an extension of Hull's mediation hypothesis. According to Osgood, there are three major aspects of language usage. These are the language <u>processes</u> of decoding, association, and encoding; <u>levels</u> of organization

including a projective level, integrative level, and representational level; and channels of communication involving auditory-vocal and visual-motor channels.

With regard to the processes that are viewed as necessary for adequate language usage, decoding involves the understanding of linguistic symbols while encoding involves the expression of linguistic symbols. Association or the inner manipulation of linguistic symbols is an inferred process which occurs in the "mind" of the organism. It is assumed to mediate between decoding and encoding and to handle input above and beyond simple decoding but prior to encoding. Such tasks as finding similarities and differences between linguistic stimuli, solving analogies and seeing associations between linguistic stimuli all are associational processes that are learned by the individual.

The levels are thought to be functional levels of the nervous system at which the processes or acts of learning occur. The least complex level is the projection level, where peripheral signals are received, recoded, and transferred to higher centers at this level, and it is believed to be unmodifiable through learning. The most complex level of organization, the representational level, is the level of meaning and consciousness; and is believed to be the center for the formation of mechanisms sufficiently complex to account for understanding words, forming thoughts, and putting these thoughts into language symbols. Some habits are learned at this level, but with sufficient practice are mediated by a level of medium complexity, the automatic level. This level involves many of our overlearned responses that are made without conscious effort or thought.

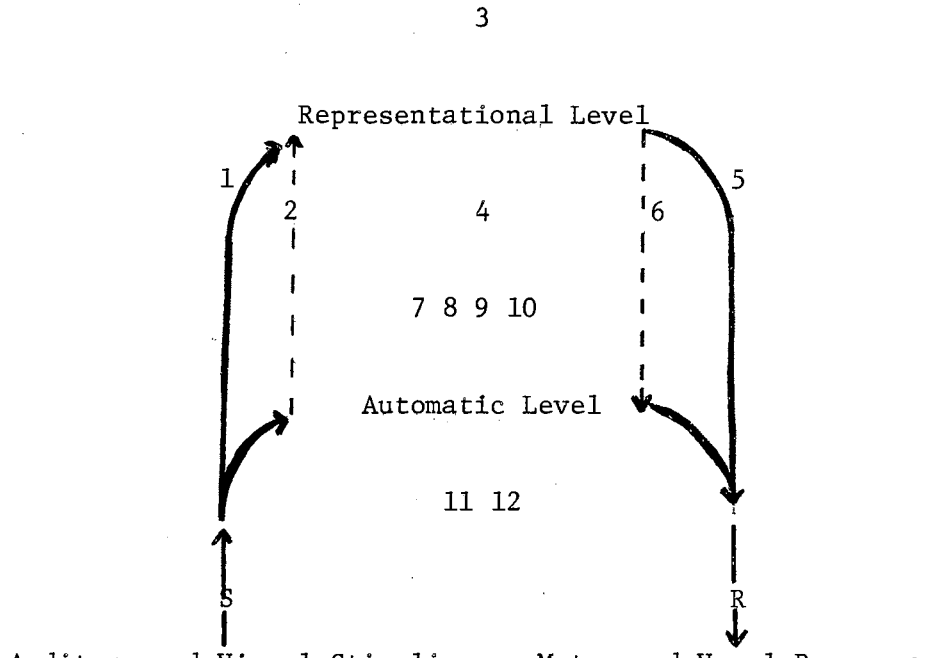
A channel is defined as a route through which language flows in the organism involving sensory input at one end and motor output at another. The major channel for primary language usage is the auditory-vocal channel named after the input and output modes respectively. Less often, the motor modality of output is used in communication efforts as seen in gestures and cues.

McCarthy and Kirk (1961) modified Osgood's formulation in order to account for practical considerations involved in adapting Osgood's model to the field of remedial education. Osgood's projection level of organization was omitted in their formulation since it was believed to be unmodifiable through learning and, as is the case with the sensory organs, to be of lesser interest to learning theorists than the representational level or automatic level.

The most recent revision of the ITPA consists of twelve subtests divided among two channels (audition and vision), three psycholinguistic processes (receptive, organizing, and expressive), and two levels of organization (representational and automatic). Figure 1 is a schematic presentation of the model of the ITPA which has been adapted from Magary (1967, p. 345) and modified in order to include the revised edition's tests of auditory and visual closure and sound blending at the automatic level.

Kass (1966) using the ITPA (1961 edition) and five supplementary measures involving visual closure, sound blending, memory for designs, perceptual speed and mazes, investigated the psycholinguistic correlates of reading disability in twenty-one disabled readers aged seven through nine inclusive. Her hypothesis, that disabled readers would be like the normative group in performance on auditory-vocal tasks at the

Receptive Process | Organizing Process | Expressive Process



Representational Level		Automatic Level	
1.	Auditory reception	7.	Grammatic closure
2.	Visual reception	8.	Auditory closure
3.	Auditory-vocal association	9.	Sound blending
4.	Visual-motor association	10.	Visual closure
5.	Verbal expression	11.	Auditory sequential memory
6.	Manual expression	12.	Visual sequential memory

Figure 1. A Model of Psycholinguistic Abilities

representational level of functioning, was confirmed for auditory decoding and vocal encoding but not for auditory-vocal association and auditory-vocal automatic. Her hypothesis, that children with reading disability would be deficient in the visual-motor tests at the representational level, was not confirmed, and in the case of visual decoding the results were in the opposite direction indicating a strength in the ability to understand the significance of what is seen. The predictions that children with reading disability would be deficient in the auditory and visual sequencing, visual automatic, sound blending, mazes, memory-for-designs, and perceptual speed subtests were confirmed with the exception of auditory-vocal sequencing.

Kass concluded that particular deficiencies exist for children with reading disabilities in the integrational process of functioning and a correlative relationship between these disabilities and lack of reading achievement was seen to be supported. This relationship suggested to Kass the necessity of adequate auditory and visual integration for reading achievement. Two of Kass's supplementary tests, sound blending and visual closure, were subsequently incorporated in the revised ITPA.

Further support for Kass's hypothesis comes from a clinical study reported by Isom (1969) involving dyslexic or severe reading disability cases. A direct correlation between performance on tasks reflecting the capacity of short-term memory, the ability to recognize the sequential relationship of temporally or spatially ordered stimuli, and the ability to transpose stimuli from temporal to a corresponding spatial array or the reverse and level of reading achievement was found. The difference between the performance levels of the different subjects was

quantitative rather than qualitative and performance on these tasks was considered to be a function of mnemonic or automatic memory.

These findings were considered to be consistent with Bateman's (1967a) contention that learning to read can meaningfully be regarded as a two-stage process in which the first stage consists of a very simple kind of learning involving sound-to-symbol correspondences, recognition of sounds corresponding to letters and letter combinations, and the ability to pronounce simple words. These tasks are considered to be a kind of simple conditioned behavior which is acquired by most children easily and quickly regardless of the kind of beginning reading instruction received. Isom (1969) hypothesized that individuals who exhibit delay in learning to read are primarily reflecting a reduced functional capacity or level of mnemonic memory. This reduced capacity in turn, is viewed as reflecting true biological developmental retardation (reduced capacity) which will subsequently improve, or normal capacity but insufficient functioning because of other factors in the environment.

De Hirsch (1963) also discussed the importance of integrational abilities for reading success and concluded that skilled reading requires a high degree of integration and differentiation, which is an ability that is defined by Gestalt psychology as competence in perceiving and responding to highly organized configurations. These critical aspects of skilled reading have been found to be either deficient or lagging in dyslexic children. De Hirsch reported that clinical investigations seem to indicate that dyslexic children have trouble with organization not only of complex linguistic forms but also with more basic motor, visuo-motor, and perceptual schemata.

D. Neville (1966) reviewed the literature on the intellectual characteristics of poor readers and reported that the data from studies both on the WISC and ITPA appear to show general agreement regarding the deficits and strengths of poor readers. On both instruments poor readers have shown disabilities in those areas involving automatic-sequential and short-term memory skills, while they have also shown strengths in those areas involving visual organization and at least average performance on the measures of representation and association skills. This finding that poor readers exhibited normal or better skills in complex tasks and inferior abilities in "more simple tasks" of the automatic-memory type led Neville to suggest differential teaching methods for these poor readers that would provide remedial assistance to the weakness while capitalizing on their strengths.

In light of Osgood's theoretical model of communication processes and the subsequent clinical and experimental research studies that have indicated deficiencies at the automatic level of functioning on the ITPA and other tests measuring similar abilities with disabled readers, the present study represents an attempt to further clarify the role of these psycholinguistic deficits and reading failure. Relatively few studies have examined the effect of these deficiencies on beginning reading, but Hyatt (1968) raised the question as to whether or not the deficiencies reported by Kass existed prior to reading instruction or whether they resulted as a consequence or along with reading failure. She found that the deficiencies existing at the beginning of the first grade were still present at the end of second grade indicating that they were not acquired as a result of reading instruction. However, no attempt was

made in her study to control the instructional methods used in beginning reading.

If integrational deficiencies are present prior to reading instruction, their effects on beginning reading instruction should provide an indication of the child's prognosis for success in view of these deficits. It would also suggest the possibility that different teaching methods might prove more effective in beginning reading instruction when the particular modality strengths and weaknesses are considered. Two of the psycholinguistic skills at the automatic level that have received considerable attention and have been shown to be important to beginning reading success are visual and auditory sequential memory. Although a more detailed review of the role of these abilities is presented in the following chapter, Johnson (1957), Raymond (1955), Myklebust and Johnson (1965), and Doehring (1968) all reported findings indicating that retarded readers have deficiencies in either auditory or visual sequential memory or both.

The preceding discussion suggesting the presence of psycholinguistic deficits, particularly in auditory and visual memory abilities, prior to beginning reading instruction and the already indicated need for individualized reading instruction based on learner characteristics have provided the rationale and direction of the present study and have raised the following questions:

1. Will children with discrepant developmental patterns of auditory and visual memory abilities learn more effectively with different teaching methods?

2. Will teaching methods that emphasize the visual modality as opposed to the auditory modality result in more effective learning for children with adequate visual memory but deficient auditory memory?

3. Will children with adequacy in one memory channel and a deficiency in another memory channel learn as effectively as children with adequacy in both channels?

Purpose of This Study

The purpose of this study was to determine the effects of selected patterns of visual and auditory memory abilities on kindergarteners' word recognition success under two methods of teaching beginning reading. The Visual-Auditory (Look-say) and Auditory-Visual (Sound-symbol) methods of teaching reading were utilized, and measures of both immediate and delayed recall were used as criteria for learning and retention under both teaching methods.

Research Questions

The following major research questions were the focus of the present study:

1. Do selected patterns of auditory and visual memory strengths and weaknesses in kindergarten students result in differential word recognition rates when taught with the Visual-Auditory teaching method?

2. Do selected patterns of auditory and visual memory strengths and weaknesses of kindergarten students result in differential word recognition rates when taught with the Auditory-Visual teaching method?

3. Do the word recognition rates of kindergarteners with visual memory strengths and auditory memory weakness indicate a greater likelihood of success with one teaching method over another?

4. Do the word recognition rates of kindergarteners with auditory memory strengths and visual memory weaknesses indicate a greater likelihood of success with one teaching method over another?

5. Do the word recognition rates of kindergarteners with evenness of auditory and visual memory development indicate a greater likelihood of success with one teaching method over another?

6. Do children with evenness of auditory and visual development learn more effectively than children with weaknesses in either visual or auditory memory under both the Visual-Auditory and Auditory-Visual methods?

7. Does the order of presentation of teaching methods result in differential learning rates for kindergarteners with specific patterns of auditory and visual memory strengths and weaknesses?

The following minor research questions will be investigated in this study:

8. Is auditory discrimination ability a variable related to any of the patterns of auditory and visual memory strengths and weaknesses in kindergarteners?

9. Is visual discrimination ability a variable related to any of the patterns of auditory and visual memory strengths and weaknesses in kindergarteners?

Definitions of Terms

Selected Patterns of Auditory and Visual Memory Abilities. Refers to an individual's performance on both of the ITPA (1968) subtests of Visual and Auditory Sequential Memory at the automatic level of psycholinguistic functioning. Three patterns of strengths and weaknesses were selected for inclusion in this study and they are operationally defined as follows:

(a) Adequate Visual and Low Auditory (AV-LA) - Visual Memory scaled score 33 (-½ S.D.) or greater, and Auditory Memory scaled score 30 (-1 S.D.) or lower, and at least 6 scaled score units (1 S.D.) between Visual and Auditory.

(b) Adequate Auditory and Low Visual (AA-LV) - Auditory Memory scaled score 33 (-½ S.D.) or greater, and Visual Memory scaled score 30 (-1 S.D.) or lower, and at least 6 scale units (1 S.D.) between Auditory and Visual.

(c) Adequate Visual and Adequate Auditory (AV-AA) - Visual and Auditory Memory scaled scores both between 33 and 39 (±½ S.D.).

Visual-Auditory Method. The method of teaching word recognition on the Ray Reading Methods Test, Experimental Edition, that emphasizes the whole word as a unit of instruction and involves the accumulation of a sight word vocabulary and an analytical approach to decoding skills.

Auditory-Visual Method. The method of teaching word recognition on the Ray Reading Methods Test, Experimental Edition, that emphasizes letters as a unit of instruction and involves the accumulation of sound-symbol relationships and a synthetic approach to decoding skills.

Word Recognition. The act of knowing a word that has been previously identified in a prior instructional session.

Immediate Recall. The total number of words correctly recognized after the twenty and sixty minute periods of the first and second instructional sessions on the Ray Reading Methods Test out of a possible number of thirty.

Delayed Recall. The total number of words correctly recognized twenty-four hours after both the first and second instructional sessions of the Ray Reading Methods Test out of a possible number of fifteen.

Order of Presentation of Methods. The process of receiving either the Visual-Auditory or the Auditory-Visual method of the RRMT first with the other method following a week later.

Intelligence. IQ scores obtained on the Peabody Picture Vocabulary Test Form B (1959).

Auditory Discrimination Ability. Performance on the Wepman Auditory Discrimination Test (1958).

Visual Discrimination Ability. Performance on the Position in Space subtest of the Frostig Developmental Test of Visual Perception (1966).

Limitations of the Study

The results of this study were limited by the tests used and the findings of this study are generalizable only to similar children in schools and communities resembling the one utilized in this study. The characteristics of the children and community used are described in Chapter III, "Population and Sample".

No attempt was made to control for any beginning reading instruction taking place either in school or at home, but all of the kindergarten teachers indicated that readiness activities, but not actual reading

instruction, are taught during the second half year of kindergarten. Prior knowledge of letter names and sounds was not controlled and wide variations in these abilities were present, but children who were known by their teachers to be reading were not included in this study.

Assumptions of the Study

For the purposes of this study, it was assumed that the instruments utilized and described in Chapter III were valid and reliable enough to be effective measures of the variables involved.

It was assumed that the statistical data on the standardization of the ITPA and subsequent research involving intra- and inter-individual differences on the ITPA subtests were valid and reliable enough to permit the group delineations made in this study.

Value of the Study

This study was believed to be of value and importance on the basis of its potential to accomplish the following objectives:

1. To provide additional information regarding the effect of auditory and visual memory abilities on kindergarteners' success in word recognition.

2. To provide additional information regarding the relationship of deficiencies at the automatic level of psycholinguistic functioning to success and failure in beginning reading instruction.

3. To provide additional information regarding the comparative effectiveness of the Visual-Auditory and Auditory-Visual approaches to beginning reading instruction.

4. To provide additional data to aid the kindergarten teacher and the first grade teacher in individualizing reading readiness and instruction based on learner strengths and weaknesses.

5. To provide further data on the Ray Reading Methods Test as a measure of preferred learning method.

Organization of the Remainder of the Study

In the following section, Chapter II presents a critical review of the literature relating to the major dimensions of this study. Chapter III describes the sample and population, procedures and instrumentation used in this study. Chapter IV presents the statistical analysis of the data and discusses the meaning of these results in terms of the hypotheses examined. Chapter V involves a summary of the design and findings of this study and discusses the conclusions that can be drawn from this data. Suggestions for future research are also made.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

This chapter presents a critical review of selected studies pertinent to the main dimensions of this study, Auditory and Visual Memory and Reading Achievement and Learner Characteristics and Beginning Reading Instruction. Both of these major headings in turn are subdivided to allow a more orderly presentation of their component aspects. A brief introduction to each of the two major dimensions is followed by the presentation of relevant research findings in the component areas with a summary paragraph synthesizing and completing each major dimension. A final cumulative summary of both major dimensions completes this chapter.

Auditory and Visual Memory and Reading Achievement

The first dimension of this study represents an attempt to bring together representative studies dealing with auditory and visual memory. As previously stated in Chapter I, these variables have been identified as two of the "integrational" or "associational" type of psychological processes that are often deficient in poor readers. In considering the research studies that have examined one or both of these processes, it must be emphasized that only limited generalizations can be drawn from

these studies since they utilized different achievement measures, different criteria for the labels normal and retarded readers, different measures of auditory and visual memory and varying controls for other relevant variables such as intelligence and socioeconomic status. Since the primary purpose of this section is to examine the relationship of auditory and visual memory to reading achievement, the methodological differences employed will not be emphasized.

For ease of consideration, this section has been organized to present first those studies examining only auditory memory and reading achievement followed by visual memory and reading achievement. The third component will involve those studies employing both auditory and visual memory measures. A final integrative summary will complete this section.

Auditory Memory

As early as 1922, Gray, et al reported that in terms of remedial reading cases, a rather subtle difficulty often evident was in the failure to remember what had been heard by the student. This deficiency was seen by the authors to frequently result in an inability to remember the sounds of words and consequently to result in confusion or even complete failure in reading.

Saunders (1931), using digits, consonants, and nonsense syllables, found that children who talked late but had a normal age of walking and dentition often had poor auditory memory. In addition, these children had speech defects earlier in life and were generally slow in acquiring facility with language and encountered considerable difficulty with phonics, and invariably they were poor in spelling. Saunders concluded

that even though all reading disabilities are not associated with poor memory spans, poor memory span certainly is associated with difficulty with reading and spelling.

Bond (1935) also used digits to measure auditory span and found a significant difference between his control and experimental groups in memory for digits. The difference in favor of the good readers also tended to be greater in the case of those taught by the visual method than in those taught by the phonetic method. Bond concluded that children with short auditory memory spans are at a disadvantage when visual rather than auditory techniques in word recognition were employed. Since Bond used the look-say type of visual method a premium was placed on the child's ability to recall a word symbol which he has been taught rather than to analyze the word into its visual or auditory components and to work out its pronunciation according to learned generalizations or principles.

Due to the fact that no measure of visual memory span was obtained and only a tendency as opposed to statistical significance was observed, Bond's conclusions regarding the relationship of auditory memory to the visual method appear to be questionable.

Monroe (1935) used a somewhat indirect approach to assessing auditory memory ability by employing a story technique with children. She concluded that children who are taught to read from sentences and stories as units must be able to retain the stories in order to associate them accurately with the words of the text.

Using Gates' Diagnostic Reading Test which has an auditory memory test consisting of ascending scales of sentence length, Lichenstein

(1938) found that the auditory memory span of twenty retarded readers was inferior to their determined learning ability.

Robinson (1946) found among her severely retarded readers that those with short memory spans for sounds made less progress in reading reconditioning than others. This was seen by Robinson as indirect evidence for the role of auditory memory span in reading.

Using a multivariable correlational study involving forty-three auditory abilities and measures of both oral and silent reading, Ewers (1950) found that was termed "auditory fusion memory span" correlated very low with silent reading but fairly high with oral reading ability.

Reynolds (1953) used unselected fourth grade students and employed a correlational analysis design between eight auditory abilities, mental age, and five measures of silent reading ability. Of the eight auditory variables, auditory memory span as measured by a group test of digit span, correlated significantly with the silent reading criterion in three of the four schools used. Despite the fact that auditory memory tended to yield the highest correlations with silent reading of all the auditory measures employed, the predictive value of auditory memory span, or the other auditory measures for that matter, did not add anything to the predictive value of mental age with general reading ability.

However, in one school it was found that when auditory memory span was combined in a multiple regression equation with word and pitch discrimination ability, they provided a significantly better prediction of word recognition ability and learning sounds than did mental age alone.

Poling (1953) studied the auditory problems of students with reading disability in an attempt to determine whether these problems are related to specific errors in word recognition. Although most of the relationships studied yielded results which were insignificant, the relationship between auditory memory span and the development of adequate word recognition appeared to be statistically significant.

Using the Stanford-Binet and employing the auditory memory span subtests, Rose (1958) found that memory span tests are extremely difficult for a large percentage of pupils with severe reading difficulty. Rose also suggested the possibility of delaying reading instruction with children having inadequate memory spans and stressed the need for teaching methods that would increase success for these children.

In a study investigating both auditory memory span and functional articulation disorders in second grade children, Cabrini (1963) found that as reading level increased there was a corresponding decrease in the percentage of cases with a short auditory memory span. Cabrini suggested that brevity of auditory memory span may be a factor which impedes ability to read well, but no such conclusion could be drawn for speech disorders.

Ellenhammer (1966) investigated the role of auditory memory span, visual matching, and a test of repeated oral reading of two stories with normal and disabled readers. An auditory memory span test with digits, as well as one with rows of syllables, was given monotonously and with various emphases. The average performance of the normal readers was found to be about eleven years of age while the dyslexic children were at the seven year level on the test with numbers even though their chronological ages ranged from ten and one-half years to thirteen and

one-half years. However, the difference between the two groups on language symbols was not as marked as for digits and most did less well on those presented monotonously. This suggests the mediating role that meaning of the stimuli play in recall tasks.

In a somewhat different approach, M. Neville (1968) compared the effects of three different methods on the development of auditory memory span for sentences, with learning level and sex as independent variables. Neville raised the question as to whether poor readers have an innately inferior memory span or whether a better memory span develops in the good readers concomitantly with their reading success. Silent, oral, and echoic reading methods were employed and she found that they had no difference on the development of memory span at the upper aptitude level but at the lower aptitude level there was a significantly smaller increase in post-test memory scores for the oral group compared to silent and echoic groups.

The results were seen as indicating a positive association between reading and memory span, although this relationship may be affected by the manner in which a child reads. Neville suggests that at the lower reading level, excessive oral reading may be detrimental to the development of auditory memory span although the hypothesized associated drop in reading achievement was not found. Silent reading practice was viewed as producing the relationship between auditory memory and word recognition as opposed to oral reading.

In a recent study employing several measures of auditory abilities of advanced and disabled third grade readers, Flynn and Byrne (1970) found that the auditory vocal sequencing sub-test of the ITPA did not distinguish between normal and retarded readers. However, the authors

definition of advanced and disabled readers as one year or above or below grade level, respectively, is probably not a meaningful definition of either.

Despite the various methodological differences and criterion definitions, it appears that the research reviewed here has indicated a positive and strong relationship of auditory memory and reading achievement. The issue of whether or not this relationship is the result of reading failure or a determinant of such failure has not been adequately researched.

Visual Memory

Although the number of research studies examining the role of visual memory alone or with other related measures to reading success has not been as extensive as those examining auditory memory, several significant studies have been reported in the literature.

In a study using span and accuracy for flashed phrases and digits, Rudisill (1956) reported that visual memory of phrases was more highly related to reading than to memory for digits. Rudisill concluded that there is a relationship between visual memory span and reading, but the fact that intelligence was not controlled, with the good readers having a mental age two years superior to the poor readers, limits the generalizability of her findings.

Both Brown (1958) and Sperling (1960) have presented evidence that immediate memory traces decay with time among presumably normal readers, and that the lowered digit span memory observed for reading disability cases was thought to be due to a faster rate of decay of immediate memory traces compared with normal readers. Alwitt (1963) tested this

hypothesis by utilizing the method employed by Sperling to study the rate of decay of memory traces as a contributing factor in the low digit spans reported above. Using nineteen pairs of reading disability and normal readers matched for chronological age and employing a visually presented digit recall task, she found no significant difference between their performance on this task. Alwitt concluded that immediate memory traces of reading disability cases do not decay at a faster rate than normal readers. An incidental finding of this study was that normal readers show a greater rate of memory for digit span with increasing chronological age than do reading disability cases.

Alwitt offered two hypotheses to interpret these findings:

1. Practice in reading may incidentally increase memory span by providing practice in perceiving and retaining large chunks of material.

2. The lowered digit span of reading disability cases is inherently associated with the substructure that underlies the reading difficulty.

She went on to suggest that the view of lowered digit span of poor readers as a function of deficit in attentional, immediate memory or response processes is compatible with both of the above hypotheses.

In a study investigating the clues children use in recognizing words, Marchbanks and Levin (1965) used a delayed visual memory task involving words on cards which were briefly exposed and then removed. A recognition task of finding the original word among a group of distractors was used as a criterion measure of memory. The results indicated that initial letters were the most important clues used in word recognition while final letters followed in importance. Presumably the child with the greater visual memory span would be able to utilize more

letters to aid in recognition, since the shape or configuration was the least used clue in recognition. In an indirect way, this study would seem to offer support for the role of immediate visual memory and reading success, particularly in word recognition skill.

Hurley (1965) used twenty-seven matched pairs of boys and thirteen matched pairs of girls in second and third grade that were classified as normal and inadequate readers. He investigated the hypotheses that integrational deficits will distinguish between these readers and that deficits in immediate visual memory and spatial-closure abilities necessitate a defect in integrative ability. Using the ITPA visual-motor sequential subtest among other measures, Hurley found a tendency for male inadequate readers to be deficient in the ability to integrate sensory input, and a suggestion supporting the one way relationship between visual sequencing ability and intersensory integration. No support for the spatial-closure ability hypothesis was found and there were several cases of children showing low sequencing ability and high integrative ability. Neither group of girls presented any support for either hypothesis and the group of factors responsible for inadequate reading in girls was felt to be different from that of boys.

In a study using the Memory-for-Designs test with fifty-four retarded and fifty-four adequate readers aged six to twelve years, Lyle (1968) found a significant difference in favor of the adequate readers. This difference was found both with the traditional scoring system and a new system that took into account all errors of displacement, addition, and omission. The results were maintained even after adjustments for IQ were made, and this led Lyle to suggest that reading retardation may be a symptom of minimal cerebral dysfunction.

It is apparent from the consideration of the above studies that most of the studies that have investigated visual memory but not auditory memory have been interested in more basic aspects of the reading process as opposed to global measures of reading achievement. The long tradition of viewing reading as primarily a visual process might explain this orientation toward basic research in visual processes. In considering the evidence on the whole, there would seem to be support for the importance of visual memory to reading success.

Auditory and Visual Memory

This section reviews those studies that have examined auditory and visual memory together in relationship to some measure of reading achievement. The advantage of these studies lies in their ability to offer comparative data on the effects of both modalities on a specific group of individuals. It is not surprising, therefore, that a large number of studies have utilized both visual and auditory memory tasks in an attempt to determine their effect on reading success.

In one of the earliest studies using both measures of auditory and visual memory, Rizzo (1939) compared 310 good and poor readers over eight grade levels, and no significant differences were found in auditory memory although the results were in the direction of favoring good readers. These differences were also larger at the lower grade levels suggesting their importance in the primary grades. The same trend was found with visual memory scores and achievement in which the good readers obtained higher but nonsignificant scores.

Stauffer (1948) investigated the interrelationships among the scores on tests of memory span employing different types of materials

and different modes of presentation. In this study, fifty-one severely retarded male readers were given the memory span battery of the Detroit Tests of Learning Aptitude. Stauffer found that retarded readers achieved significantly higher scores on nonverbal measures of visual memory span than in verbal measures of auditory memory span.

Retarded readers also attained higher scores with related items than with the unrelated items on verbal measures of memory span. Since Stauffer only used retarded readers, no data was available on normal readers on the same tasks and only limited generalizations could be made from his data.

In order to provide comparable data on normal readers, Raymond (1955) used fifty reading achievers of average intelligence and administered them the same measures of memory span as the previous study but added a few additional measures. Raymond found for her reading achievers that a visual presentation was easier than an auditory one, and there was a significant difference between related and unrelated items when the presentation was auditory. They also made significantly higher scores with digits forward presented visually than orally. In general, the retarded readers of Stauffer's study and the achieving readers of this study were able to be discriminated with just about all memory tests, but Raymond expressed caution in making comparisons due to the fact that the groups were neither equated nor matched.

Johnson (1957) using thirty-four seriously retarded readers, but no control group, found that deficiencies in memory span were an outstanding characteristic of severely retarded readers. However, memory span for pictured objects appeared to be adequate while auditory unrelated

digits reversed, visual letters, auditory related, oral directions, digits forward, and visual objects were difficult in the order mentioned from most to least difficult. Verbal and unrelated materials tended to be most difficult.

Sandstedt (1964) investigated the possible relationship between memory span and intelligence of retarded readers and found much communality between these tests and intelligence measures. She also confirmed Stauffer's (1948) previous finding that retarded readers were more successful with the visual test of unrelated objects (nonverbal) than with the auditory test of unrelated objects (verbal). Sandstedt suggested that the general tendency to attain higher scores on total visual memory span might be indicative of aural difficulty with verbal materials rather than an indication of a deficient auditory memory span in itself.

As mentioned in Chapter I, Kass (1966) found that children with reading disability were deficient in visual-motor sequencing but not on auditory-vocal sequencing on the ITPA. Several research studies with different populations have been generated by this study in attempts to validate Kass's hypothesis of "integrational" deficiencies of disabled readers.

Ragland (1964) using educable mentally handicapped children of different reading ability found that the retarded readers were significantly inferior to the group of non-retarded readers on the total automatic sequential level and on the auditory-vocal automatic subtests of the ITPA as well as the total ITPA score. Ragland viewed these results on an intellectually limited school population as support for the

relationship between ability in rote memory and chain-habit type tasks on one hand and reading ability on the other as suggested by Kass.

In a related study, McLeod (1967) gave psychological and psycholinguistic tests to twenty-three retarded and twenty-three control readers of seven years of age in Australia. Factor analysis indicated that the two factors that made the largest contribution to prediction of group membership of the subjects were those designated as Sequencing-Integrative and Auditory Language Input Capacity. These factors were allowed by Encoding and Planning with a fifth factor, Visual-motor, making no contribution. The four contributing factors together yielded a multiple correlation coefficient of about .85 with the criterion. This study was seen as supporting the role of sequencing integrative abilities (memory) in reading success.

In a study using normal children of differing reading ability, Hepburn (1968) found that low reading subjects differed most from subjects in the high reading groups on the auditory-vocal automatic, auditory-vocal association, and visual-motor association association subtests of the ITPA. These results were consistent with those reported by Kass (1966) for disabled readers with the exception that Kass found deficiencies in visual-motor sequencing while Hepburn did not.

However, this may have been due to Hepburn's definition of a "low reader" as a third grader with a reading level between 1.8 and 3.6 on the combined scores of word recognition and paragraph reading on the Gates tests. Most of the previous studies have defined disabled readers or retarded readers with much greater deficiencies than reported in this study.

The four preceding studies including that of Kass have all reported deficiencies in "integrative" functioning with particular reference to sequencing subtests of the ITPA. The subjects have involved normal and disabled readers, normal intelligence and educables as well as foreign students, but the presence of psycholinguistic deficiencies of "integrational" nature were found in each. The apparent failure of auditory-vocal sequencing to discriminate as effectively as its visual counterpart appears to be an artifact of the subtest itself rather than the ability of auditory memory.

Doehring (1968) reported an extensive study with retarded readers that was designed to determine what other abilities among boys with reading disability were subnormal and how these other disabilities may be related to their reading problems. A control group of normal readers was used for comparison purposes and a battery of sensory, motor, perceptual, verbal, and neurological tests were given to both groups.

Statistical analysis of the data indicated that the normal readers were superior to the retarded readers on sixty-three of 103 measures.

The deficit pattern was characterized by an interaction of visual and verbal impairment involving both verbal and non-verbal skills and both visual and auditory verbal skills. Retarded readers were found to have visual and verbal sequencing highly correlated with reading while for normal readers, oral vocabulary test scores correlated highly with reading. Doehring concluded that the retarded readers' poor performance on reading and spelling type tasks were related to the inferior sequencing abilities of these readers.

Bean (1967) came to a similar conclusion with fifty matched pairs of junior high students, who were retarded at least two years from their

expectancy. Using a factor analysis procedure similar to that of Doehring, Bean concluded that the deficit that appears critical in reading retardation is sequential memory. The retarded readers were found to score significantly lower on the digit span of the WISC, on reproducing from memory an unfamiliar word after a brief exposure and the amount of data they could remember from a passage read to them. A deficit in sequential memory was also seen in non-verbal material such as the WISC coding and mazes on which retarded readers were significantly lower.

Bean inferred from these results that retarded readers exhibit some minimal amount of brain dysfunction since sequencing difficulty in all modes was seen in children with brain damage. It is important to note that sequencing deficiencies were still evident in older children suggesting the possibility that memory abilities unlike other perceptual abilities remain or even increase in importance with increasing chronological age.

Morency (1968) reported the results of a study that involved testing children at the beginning of first grade and upon the end of second and third grades to determine changes in auditory and visual perception scores in relation to reading. Using experimental tests of visual and auditory memory among others, she found that there was a significant increase in auditory and visual perceptual scores except in visual memory. In addition, coefficients of intercorrelation between visual and auditory gains were not significant and this suggests differential modality development. This lack of improvement in visual memory suggests the possibility that it is a more basic ability not easily improved with learning.

In a study investigating associative learning and memory span of retarded and achieving Negro readers, G. L. Johnson (1968) found that achieving readers significantly surpassed retarded readers in retaining auditory words, syllables, and visual objects and letters. In addition, related sentences and unrelated words, objects, and letters, and unrelated verbal materials were also retained better. Achieving readers also attained higher mental ages on memory span tests compared to their Binet mental ages as Rose (1958) has already indicated. Retention of visual digits forward was better than auditory digits forward and performance was better on related materials presented arythymitically.

Bruininks (1969) investigated the relationship between auditory and visual perceptual skills and reading achievement of third grade disadvantaged Negro boys. Using the digit span of the WISC and the visual-motor sequencing and visual-motor subtests of the ITPA along with five other auditory and four other visual perception tests, he found that the digit span but not the visual-motor sequencing test, along with five others, produced significant correlations with reading achievement both with IQ controlled and included in the analyses. Most of the tests producing significant correlations were in the auditory modality.

Bruininks' data also indicated that the correlations between perceptual skills and reading success tend to decrease with age as opposed to the relationship between intelligence and age. This was supported by the fact that the Stanford-Binet produced a higher correlation with reading performance than any of the twelve subtests.

In a study using children in grades one through six, Rodenborn (1969) investigated the relationship between auditory and visual memory

and auditory and visual integration ability to oral reading. One of his findings was that auditory memory did not contribute significantly to a multiple correlation between visual memory and two integration tests with oral reading comprehension.

In addition, when a multiple regression equation to predict oral comprehension was employed, the four tests of visual memory, auditory memory, and two integration abilities produced a multiple correlation of .81. However, of these four tests, only visual memory was found to be a significant predictor in this equation. These results seem to suggest that visual memory remains a significant factor in determining reading success despite increasing age, as Alwitt (1963), Bean (1967), and Morency (1968) have also suggested.

Linder and Fillmer (1970) examined the relative effectiveness of auditory, visual, and simultaneous auditory-visual presentations in second grade Negro boys who were poor readers. They used sequential recall tasks to compare the effectiveness of these three presentations and found that total auditory performance was significantly poorer than visual or auditory-visual performance with no significant difference found between the latter two. It was also found that these poor readers did better with concrete or meaningful recall tasks than on abstract recall tasks. However, since the authors used a low intelligence range (75-95), the association of memory span with intelligence may have accounted for much of their findings in regards to the concrete-abstract dimension.

Goodtein and Whitney (1970) found both the auditory-vocal sequencing and visual-motor sequencing subtests of the ITPA to be significantly correlated with perceptual reading achievement, with visual memory

considerably higher than auditory memory. In fact, using a multiple regression analysis, visual-motor sequencing significantly increased the magnitude of this correlation when it was added to the Metropolitan Readiness Test Total and Frostig Form Constancy coefficients.

In addition, when only average IQ, good and poor readers were considered, a significant difference between these groups in favor of good readers was obtained on the visual sequencing subtest as well as the other two predictors. Interestingly enough, none of these subtests discriminated between good and poor readers of low IQ.

Nurss (1970) also compared third grade Negro children and, using the Metropolitan Reading Tests in the fall and in the spring, found that in those children experiencing difficulty in reading, the variables significantly related to this are primarily visual-motor perceptual and sequencing in nature rather than language in nature. These children had apparently not mastered the decoding aspects of reading and even when the effects of IQ are removed, a significant correlation between the Metropolitan Reading in the fall and ITPA visual-motor sequencing ($r = .48$) and between word reading in the spring and WISC picture arrangement ($r = .51$) were found.

In both of these instances, it was a relationship between a visual sequencing variable and reading that was identified. Nurss has suggested that perceptual training, both visual and auditory with an emphasis on sequencing and immediate memory span, would be particularly valuable for children with reading difficulty.

The preceding studies of Johnson, Bruininks, Linder and Fillmer, Goodstein and Whitney, and Nurss have all reflected the recent interest

in studying the disadvantaged, particularly Negro children. Their findings taken as a group have found essentially the same deficiencies in retarded readers that previous studies have reported on "advantaged" populations. Again auditory and visual memory, and in particular visual abilities, have been reported as outstanding characteristics of poor readers.

Eakin and Douglas (1970), in a recent study, have found additional evidence that supports Kass's findings of disabled readers doing poorly on tasks designed to measure overlearned abilities at the "automatic-sequential" level of language. They employed Broverman's (1960) concept of "automatization cognitive style" that describes a series of tasks that rely on automatic skills for their execution and extended this concept to the case of children with oral reading problems. They found that automatization abilities of these children differed significantly from children with average or good oral reading ability but on tasks defined by Broverman as "non-automatization" or "restructuring", they did equally as well as the normal children.

The authors have speculated as to the possibility of a "neural fatigue factor" that might affect over-learning and have suggested specific teaching techniques to overcome what they term a "basic disability". The similarities of these findings and those of Kass suggest that the presence of "automatic" level or integrative abilities may be a basic deficiency of disabled readers.

Summary and Conclusions

In the preceding pages, the role of auditory and visual memory abilities to reading achievement have been examined individually and in

conjunction with each other. Despite the variations in measures used, populations studied, and the criteria employed, the following conclusions appear justified:

1. Auditory and visual memory appear to be significantly correlated with reading achievement.

2. Both memory abilities tend to be less influenced by chronological age than other measures of perceptual functioning, but tend to be more influenced by mental age than such perceptual abilities.

3. Few of the studies have isolated these two abilities and employed an experimental design in order to determine their effect on specific reading skills, and none have employed pre-readers or kindergarteners.

4. There appears to be considerable support for deficiencies in these abilities to be a manifestation of a more basic deficit in "integrative" processes of an automatic nature as suggested by Kass.

Learner Characteristics and Beginning Reading Instruction

The second major dimension of the review of the literature primarily involves a consideration of those studies that have attempted to match learner characteristics and reading methods with an aim towards validation of the modality concept discussed in Chapter I. In order to provide a framework for evaluating these studies, a brief discussion of theory and research regarding the nature of the reading process and task analyses of the two major approaches to reading instruction precedes these studies.

The Reading Process

As Dechant (1970) suggested in his review of the problem, there are about as many definitions of reading as there are experts. He categorized the various definitions into a threefold classification of reading as "interpretation of experience" and reading as "interpretation of graphic symbols" and finally as a combination of both appraoches.

Chall (1967) suggested essentially the same thing as Dechant regarding definitions of reading and has pointed out that the various definitions are often a reflection of a particular method championed by a particular reading authority.

The preceding situation seems to be a reflection of the larger look-say versus phonic controversy that has prevailed at different times in different intensities over the past seventy or so years of American education. Despite its sometimes emotional and irrational aspects, this meaning versus non-meaning emphasis dispute remains an enduring issue. Attempts to evaluate this problem experimentally have not produced conclusive evidence for one method over the other as the U.S.O.E. First Grade Reading Studies (1966) have indicated. However, Bliesmer and Yarborough (1965) found that children receiving a heavier code emphasis whether phonics or linguistic scored higher than those using the conventional basal reader series with their meaning emphasis, on the Stanford Achievement Test at the end of the first grade.

Chall (1967) concluded that the research evidence, both experimental and correlational, has shown that a code emphasis tends to produce better overall reading achievement by the beginning of fourth grade than a meaning emphasis. She further stated that a code emphasis

results in greater accuracy from the beginning in word recognition than with a meaning emphasis.

Despite the proliferation of alternative approaches such as linguistic word structure and language experience, and new materials and techniques in beginning reading instruction, the basic dichotomy proposed by Lowry (1970) for conceptualizing the approaches to beginning reading as either analytic or synthetic appears to be valid and helpful. In Figure 2, Lowry's paradigm is presented, and it is apparent that the look-say or visual-auditory approach typifies the global or analytic approach to word decoding. The phonic or auditory-visual approach is atomistic in the sense that the individual letter-sound associations are the unit of instruction.

Lowry emphasized the importance of the first level in his model, Learning Modalities, by which instruction can be successfully channeled. He further emphasized the need for teachers to identify the modality through which the reading process takes place more easily and permanently in different learners. He did not suggest what these strengths and weaknesses might be nor did he identify the components of each of the reading methods that would make one method inherently more effective.

In recent years, increasing attention has been focused on the more basic aspects of reading including an examination of the reading process itself in terms of the hierarchy of sub-skills involved in reading. Much of the impetus for such research efforts probably derives from the work of Gagne (1965) who has formulated a hierarchy for reading among other disciplines. Gagne identified a number of performances which reflect the outcomes of learning, and he has drawn a distinction between

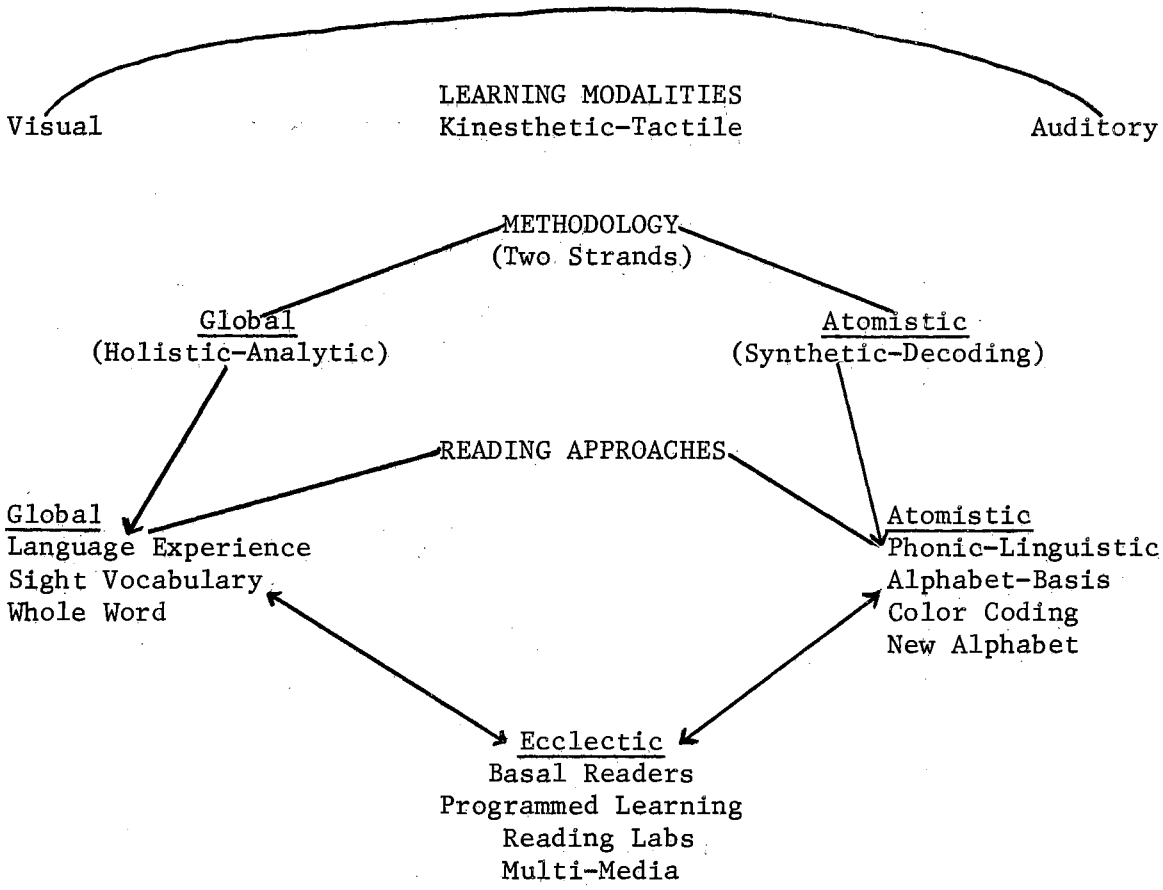


Figure 2. Curriculum Model for Beginning Reading Instruction

the performance made possible by learning and the capabilities inferred as underlying these performances.

One noteworthy effort that has identified terminal behaviors (performance) as well as hypothesized subskills (capabilities) is seen in Chalfant and Scheffelin (1969), who proposed a task analysis of both the whole-word (meaning) and sound-symbol (code) approaches to beginning reading. In Figures 3 and 4 these models are presented as tentative hypotheses regarding the component subtasks of the reading process.

As an examination of these figures indicates, it appears that a sound-symbol or code approach makes more demands on the learner in terms of the sub-abilities required to produce the terminal behavior of word recognition (reading). Auditory discrimination, memory, and sequencing, auditory closure, and sound blending are four of the critical sub-skills involved in correctly identifying the word at a subsequent exposure. There appears to be no such comparable abilities in the visual modality for the whole-word method other than visual discrimination and memory. Based on these task analyses, it would appear that children given a similar number of words with the same amount of instructional time allotted would probably be more successful with the whole-word approach than the sound-symbol approach. This is based on the assumption that the children would enter the reading situation with most, if not all, of these sub-skills fully developed.

The evidence from many of the more widely used readiness tests as well as the ITPA also suggest that children tend to have wide variations in the development of these abilities on entering the first grade.

In Chapter I, it was reported that Isom (1969) had cited Bateman's (1967a) rationale for the view of reading as a non-meaningful auditory

I. Attends to visual stimuli.....cat

II. Identifies visual stimuli as graphic word unit.....cat

III. Retrieves auditory language signal for graphic word unit.....cat ⟶ (/kaet/)

IV. Responds by saying /kaet/...../kaet/

Terminal behavior: Given a graphic word unit such as "cat", the reader says the word name "/kaet/" within five seconds.

Legend:

cat.....Visual stimulus

cat.....Graphic word unit perceived as a whole visual image

⟶ .....Association in the direction indicated

(/kaet/).....Recalled auditory language signal

/kaet/.....Spoken word or auditory language signal

Figure 3. A Whole-Word System of Reading: A Task Analysis

I. Attends to visual stimuli.....cat

II. Recognizes stimuli as graphic word unit.....cat

III. Identified stimuli as sequence of discrete letters.....1st c _ 2nd a _ 3d t

IV. Retrieves phoneme for each grapheme.....c → (/k/)
a → (/ae/)
t → (/t/)

V. Recalls phonemes in temporal sequence corresponding to graphic sequence in step III..... 1st (/k/) _ 2nd (/ae/) _ 3d (/t/)

VI. Blends phonemes into familiar auditory language signal.....(/kaet/)

VII. Responds by saying /kaet/.....(/kaet/)

Terminal behavior: Given a graphic word unit such as "cat", the reader says the word name /kaet/ within five seconds.

Legend:

cat.....Visual stimulus

c-a-t.....Discrete letters in sequence (graphemes)

(/k/).....Recalled auditory sound signal (phoneme)

→ .....Association or correspondence in the direction indicated

(/kaet/).....Discrete sounds blended into word

/kaet/.....Spoken word or auditory language signal

Figure 4: A Sound-Symbol System of Reading: A Task Analysis

process. Drawing on the work of Kass and Ragland mentioned previously, as well as her own investigations, Bateman identified two stages in reading, the first of which is designated the process of reading. This stage involves the making of differential responses to visual stimuli and converting these symbols (stimuli) into sounds. Stage two involves the auditory recall of the meaning of the sounds produeced in stage one. Although Bateman acknowledges that this second stage should be taught directly and explicitly to children, she contends that in beginning reading instruction, the child has quite enough to do in stage one and hence should not be complicated by simultaneously requiring stage two.

Bateman has urged that reading be taught as a rote, conditioned mechanical process of converting letters to sounds, and that the comprehension of many symbols (including sounds combined into words) be taught as a separate process. Bateman believes that all reading disabilities occur in stage one. This is because she defines a reading disability as a discrepancy between skill in comprehending symbols (mental age, roughly translated) and in converting visual symbols to sounds and then obtaining meaning from them (reading as traditionally measures including both stages one and two).

The research of Bliesmer and Yarborough (1965) already mentioned in reference to Chall, as well as her own study presented in the following section, are cited by Bateman as support for her point of view.

Modalities and Reading Instruction

There are a number of recent studies which have specifically tried to compare the effectiveness of different reading methods with various modality preferences of learners.

Harris (1965) examined the visual, auditory, and kinesthetic patterns of first graders in relation to their corresponding reading approaches, but he failed to find any significant association between the specific reading method and the presumed aptitude for that method.

In an extensive study mentioned previously in Chapter I, De Hirsch, et al. found that all of the children rated as superior visual-perceptual but poor auders (n = 3) in kindergarten achieved high scores on reading tests at the end of the second grade. Of those children who were superior auditory perceptual but poor visualizers (n = 7), five passed and two failed all reading tests at the end of second grade. Those children who passed had been intensively trained in phonics while the two that failed all reading had received no phonics training. The authors' conclusion that teaching methods should to a large extent be determined by modality strengths and weaknesses is, of course, limited by a very small number of subjects and poor controls for methods of instruction.

Bateman (1967b), using first graders previously designated as auditory or visual learners, found that the auditory method of instruction (Lippincott Series) was superior to the visual method (Scott Foresman Series) for both reading and spelling achievement at the end of first grade. The auditory-modality preferred subjects were superior in both reading and spelling achievement to visual modality preferred

subjects and there was no interaction between subjects' preferred modality and the method of instruction used.

It is important to note that although the full ITPA was used, the designations of auditory and visual was based on the children's performance on the auditory and visual memory subtests of the ITPA which showed the largest discrepancy. In addition, the mean IQ of all children was 125 and an upper middle class community was used in which first graders who read at 2.9 grade level were labeled "poor" readers.

Using disadvantaged second and third grade Negro boys, Bruininks (1968) investigated whether matching teaching method to the auditory and visual perceptual strenths would facilitate the learning of unknown words. Bruininks used a battery of six auditory and six visual perceptual tasks to group children into auditory and visual modality groups and used the look-say and phonic approaches of the Mills Learning Methods Test (1964). Bruininks found that the children learned to recognize unknown words equally well under teaching procedures which match either their perceptual strength or weakness even though a trend in favor of the visual method was noted irrespective of modality preference. These results are not surprising in view of the decreasing importance of perceptual skills and increasing importance of intelligence with age.

The inability of these three studies to find the interaction between modality and method suggested by De Hirsch (1966) on a limited clinical population does not indicate that the modality concept is untenable. The limitations of these studies along with the general paucity of experimental research studies in this area precludes any firm conclusions. The present study is an attempt to identify a basic

relationship between one modality determinant, memory, and one aspect of reading achievement, word recognition, that has not been explored in a non-reading kindergarten population.

Chapter Summary

This review of the literature has revealed that four generalizations can be made regarding the literature relevant to this present study:

1. Both auditory and visual memory abilities appear to be related to reading achievement, and deficiencies in one or both of these abilities may be part of a more basic deficiency that precedes rather than results from reading failure.

2. The sub-skill requisites for success in both the auditory (phonic) and visual (look-say) methods of beginning reading can be tentatively identified and the learner abilities that would seem to increase success in both these methods may be based on modality preferences.

3. Although the evidence is relatively scarce and inconclusive, modality based learning in beginning reading appears to be a valid and useful concept that needs further investigation.

4. There is a need for a study examining the role of and visual memory abilities of kindergarten children, who have not begun reading instruction, in terms of their word recognition success with the visual and auditory methods.

Restatement of the Purpose of the Study

The purpose of this study was to determine the effects of selected patterns of visual and auditory memory abilities on kindergarteners' word recognition rates under two teaching methods. The next chapter describes the sample and population and procedures used to investigate the research questions raised in Chapter I.

CHAPTER III

METHOD AND PROCEDURE

Sample and Population

The subjects for the present study were all kindergarten students enrolled during the 1970-71 academic year in the Ponca City, Oklahoma, Public Schools. Ponca City can be characterized as a predominantly white, middle class, semi-rural community with a 1970 population of approximately 26,000 people, according to the 1970 census data. The census data have also indicated that ninety-four percent Caucasian residents, three percent Negro, and three percent "other" residents comprise the total population. Most of the "other" residents were of American Indian extraction.

There were approximately 6,500 children attending the local schools of which the kindergarten population numbered 372 children. The kindergarten children attended nine "neighborhood" schools with nine morning and eight afternoon sessions. There were eleven kindergarten teachers with an average class size of twenty-two children. In some schools, the children were assigned on the basis of age while in others it was on a random basis. In order to be eligible for kindergarten, it was necessary for a child to have been five years of age by November 3rd of the current school year.

Methodology and Design

All of the kindergarten children in each of the classes were administered the following tests between October, 1970 and January, 1971:

1. Peabody Picture Vocabulary Test (PPVT) Form B developed by Dunn (1959).

2. Visual Sequential Memory and Auditory Sequential memory subtests of the Illinois Test of Psycholinguistic Abilities (ITPA) Revised edition developed by McCarthy and Kirk (1968).

All of the tests were given individually in one testing session lasting approximately twenty-five minutes per child. A brief discussion to achieve some rapport was followed by the administration of the PPVT, the Visual Sequential Memory and Auditory Sequential Memory subtests of the ITPA, in that order. All testing was conducted by this writer, two experienced speech and hearing clinicians, and this writer's wife who received supervised practice in the administration and scoring of all instruments.

All testing was done in unoccupied rooms that were provided near the kindergarten classrooms. A desk and two chairs were also made available to the experimenters. The rooms were generally quiet, well lighted, and free from distracting noises.

Some of the children refused to cooperate or were upset by the testing situation and complete data were unable to be obtained. In addition, several children were absent for a series of days which prevented their being included in the testing. The total number of children from both of these groups amounted to ten children which is

equivalent to only two and one-half percent of the population and was not statistically meaningful.

The first two classes that were tested were designated the pilot classes for the purpose of obtaining familiarity with the screening instruments and all subsequent measures. These two classes had been randomly selected from the total population of seventeen classes prior to the beginning of the screening process.

The results of the phase of the study are presented in Table I.

TABLE I

CHARACTERISTICS OF TOTAL KINDERGARTEN POPULATION
(n = 362)

	Chronol. Age (months)	I.Q.	Vis. Mem. Scaled Score	Aud. Mem. Scaled Score	Diff. A-V	Vis. Mem. PLA	Aud. Mem. PLA	Diff. A-V
Mean	65.2	100.3	34.2	38.3	4.1	64.8	74.5	9.7

It is important to note that the mean Auditory Memory Scaled Score and Psycholinguistic Age of the total population exceeded the corresponding Visual Memory values by 4.1 scaled score units and 9.7 months respectively. These discrepancies are important in terms of the following section in which experimental subjects were arbitrarily defined and grouped.

Since an individual's score on each of the twelve subtests of the ITPA can be expressed as either a raw score, psycholinguistic age (PLA), or scaled score, McCarthy and Kirk (1968) have recommended the use of scaled scores in contrast to both raw scores and PLA scores due to the fact that they take into account not only the mean performance of the normative groups but also the variability of scores about the mean. Such scores are most appropriate in evaluating the individual's standing relative to the normative group or to another child. They may also be used to compare the groups of nonequivalent chronological age.

All subtests have a mean scaled score of thirty-six and a standard deviation of six. Paraskevopoulos and Kirk (1969) have indicated that, based on the standardization sample of 128 children between the ages of five years, seven months and six years, one month, seventy-six percent obtained auditory sequential memory scaled scores between ± 6 from the mean while eighty percent obtained visual sequential memory scaled scores between ± 6 of the mean of thirty-six. In addition, twelve percent of the auditory memory scores were -7 or below, while thirteen percent of the visual memory scores were -7 or below.

Based on these psychometric characteristics, the following three experimental populations were delineated from the parent population of 362 kindergarteners, and they were operationally defined as thus:

1. Adequate Visual - Low Auditory Memory (AV-LA)
    a. at least six scaled score units (1 s.d.) between visual and auditory memory
    b. visual memory scaled thirty-three ($-\frac{1}{2}$ s.d.) or greater
    c. auditory memory scaled score thirty (-1 s.d.) or below

2. Adequate Auditory - Low Visual Memory (AA-LV)

   a. at least six scaled score units (1 s.d.) between auditory and visual memory

   b. auditory memory scaled score thirty-three ($-\frac{1}{2}$ s.d.) or greater

   c. visual memory scaled score thirty (-1 s.d.) or below

3. Adequate Visual - Adequate Auditory Memory (AV-AA)

   a. auditory memory and visual memory scaled scores both between thirty-three and thirty-nine ($\pm\frac{1}{2}$ s.d.)

In addition to meeting the above criteria for inclusion in one of the three delineated subgroups, each subject had to meet the following criteria:

1. Attending kindergarten for the first time and at least five years of age at the time of testing.

2. Attained an IQ score between 80 and 120 on the PPVT.

3. Attained satisfactory evaluations on vision (Telebinocular) and on hearing (Pure tone audiometer) tests conducted during the system wide screening of kindergarteners in the fall of 1970. Children with corrected deficiencies were included in the experimental groups.

4. Evaluations as a "non-reader" by the classroom teacher and demonstrated unfamiliarity with the test words at the beginning of instruction.

Using the preceding criteria, the number of children identified for each of the subgroups are presented in Table II. Since the total number of each of the subgroups was unequal, a stratified random assignment procedure using a table of random numbers allocated the subjects in experimental teaching groups of five subjects each. Since all of the

fourteen kindergarten classes were represented by each of the subgroups, this stratified sampling procedure guaranteed the utilization of all twenty-three of the subjects of the AV-LA group and that the random assignment within each class involved only subjects from the AA-LV and AV-AA groups. If, for example, the case in which one kindergarten class had only two AV-LA subjects and five AA-LV and four AV-AA subjects, one of the four AV-AA subjects would be randomly selected for inclusion along with two AA-LV subjects.

TABLE II

IDENTIFICATION OF EXPERIMENTAL GROUPS OF SUBJECTS IN TOTAL POPULATION (n = 362)

	Experimental Groups			
	AV-LA	AA-LV	AV-AA	N
Identified	23	53	50	126

This procedure was followed in each of the fourteen classes, and provisions were made to keep the total number of AA-LV and AV-AA subjects approximately equal. The random order of selection of all AA-LV and AV-AA subjects was retained for subsequent use in cases where an originally selected subject was "lost" from the treatment group due to absence, moving, or demonstrated knowledge of the test words prior to the teaching session.

Each of the selected subjects comprising the fourteen experimental groups (n = 70) were given the Wepman Auditory Discrimination Test developed by Wepman (1958) and the Position in Space subtest of the Frostig test (1966) prior to the start of the experimental treatments. Although these variables were not being directly investigated in this study, it was decided that due to their importance in beginning reading instruction, they would provide important additional information in interpreting the results of this study. Table VI in Chapter IV summarizes the characteristics of the three subgroups of subjects in terms of selected variables considered in Table I of this chapter, as well as their auditory and visual discrimination scores.

The research design for this study is presented in Table III. Each of the experimental subjects were given both the Visual-Auditory and Auditory-Visual portions of the Ray Reading Methods Test. The fourteen experimental teaching groups of five subjects were randomly assigned to receive either the Visual-Auditory method the first week and the Auditory-Visual method the following week or the opposite order of treatments. This procedure was necessary to counterbalance the order effect of receiving one method prior to the other. The method of incomplete counterbalancing for two conditions suggested by Zimmy (1961) was used to assign the order of treatments and this is presented in Table IV.

In those cases where an originally selected subject was absent from school on the first day of the testing session, an alternate member was selected to insure beginning with a group of five subjects in all cases. When a group member was absent from school for the second day of instruction, no substitution was made due to the nature of the method.

A subject had to be present for all three days of both instructional methods in order for his scores to be included in the statistical analysis in Chapter IV.

TABLE III

THE RESEARCH DESIGN

Group	Teaching Methods: Visual-Auditory	Teaching Methods: Auditory-Visual	n
AV-LA	23	23	46
AA-LV	24	24	48
AV-AA	23	23	46
Totals	70	70	140

TABLE IV

COUNTERBALANCING OF TREATMENTS IN CLASSES

Order of Treatments	School and Class: A AM	A PM	B AM	B PM	C AM	C PM	D AM	D PM	E AM	E PM	F AM	F PM	G AM	G PM
V-A	1	2	2	1	1	2	2	1	1	2	2	1	1	2
A-V	2	1	1	2	2	1	1	2	2	1	1	2	2	1

Class	Summary of Treatments: Order 1-2 (V-A,A-V)	Order 2-1 (A-V,V-A)	n
AM	4	3	7
PM	3	4	7

In those cases where a subject was present for the first week's instruction in one method but was absent for the first day of instruction in the second method, an alternate was chosen of similar subgroup designation (i.e. AV-LA) and both subjects were designated as "incomplete for one method". A final tabulation of complete and incomplete subjects is given in Table VII of the next chapter. These subjects were not retained in the statistical analysis of the data since complete data for both methods were not available.

Procedures

A quiet, well lighted room in each school was obtained for the teaching sessions. All rooms were provided with either small desks and/or chairs for the subjects and a larger chair for the experimenter. The chairs for the subjects were arranged in a semi-circle with the experimenter in the middle facing the subjects and about three feet from each subject.

The experimenter for all the teaching sessions was this writer's wife who is a college graduate with a major in psychology and a minor in elementary education. She had had experience both teaching and working with young children and extensive practice and pretesting of the Ray Reading Methods Test was obtained on pilot classes of kindergarteners in the fall of 1970.

The teaching sessions extended continuously from mid-February, 1971 - mid-April, 1971 with no interruptions other than unforeseen inclement weather and illness. The teaching formats employed were the same as the procedures described in the manual of directions for the Ray Reading Methods Test which is included in Appendix B.

The procedures described in the manual were followed systematically with the exception of several modifications. On the Visual-Auditory portion, poster sheets with the relevant word or sentence printed in black ink were presented to the children in lieu of a chalkboard or tablet. Such a modification was made due to the observed tendency of the children to lose attention as the experimenter turned around to write on the board as well as the unavailability of chalkboards in some classes. The lower case letters were printed three inches high in dark black ink from a marking pen making them clearly visible to all children at three feet.

A second modification was the use of large letter and word cards for the Auditory-Visual portion in place of the original three by five inch cards with half inch black letters. The word cards used in the experiment were of white poster board and were fourteen inches long and five and one-half inches wide. The letters and words were printed in lower case form in black marking ink about three inches high and two inches wide. All instruction and recall utilized these larger cards since it was noticed that young children had difficulty in discriminating letters of the original size at a distance of three feet.

An added stimulus card was introduced to aid the children in blending the letter sounds of the first word "mat" in the first instructional period of the Auditory-Visual method. This modification was suggested by the author of the Ray Reading Methods Test due to the difficulty that many young children have in blending or synthesizing sounds of letters at this age. This additional card was of the same size as the others and with the same size letters except for the inclusion of dashes between the letters to produce m-a-t.

A standard format for the pre-instructional session of twenty minutes was followed, and this rapport building session consisted of the reading of a story called "My Elephant Book" by Kathleen M. Daly (1966) to the children and of a discussion of the pictures in the story. The time allotment for all instructional sessions and interim sessions were carefully adhered to by the teacher-experimenter. All sessions were timed so as not to interfere with recess and refreshment periods of the children. All of the testing (recall) sessions were done individually with the other children removed from the room. Periodic observations of the experimenter by this writer were made to ascertain adherence to the test format and to produce a standardized procedure for all subjects.

In order to understand better the experimental procedures employed, Table V presents a calendar of the experimental events taking place with four classes during one week. It will be noted in examining this table that two weeks' time was necessary for each class to receive both experimental treatments. In addition, four days elapsed between the end of one method and the start of the other method for each class.

The results of administration of the RRMT as well as the data from the other measures employed, is presented as Appendix A at the end of this study.

Instrumentation

Illinois Test of Psycholinguistic Abilities (1968 revision)

The Illinois Test of Psycholinguistic Abilities (ITPA), as indicated previously in Chapter I, is an individually administered, diagnostic test of psychological and linguistic functioning that is

TABLE V

CALENDAR OF EXPERIMENTAL EVENTS

Session					
AM	First Instruction Period of V-A Method in Class 1	Second Instruction Period of V-A Method in Class 1	Delayed Recall of V-A Method in Class 1 First Instruction Period of A-V Method in Class 2	Second Instruction Period of A-V Method in Class 2	Delayed Recall of A-V Method in Class 2
PM	First Instruction Period of A-V Method in Class 3	Second Instruction Period of A-V Method in Class 3	Delayed Recall of A-V Method in Class 3 First Instruction Period of V-A Method in Class 4	Second Instruction Period of V-A Method in Class 4	Delayed Recall of V-A Method in Class 4

based on Osgood's (1957) theoretical model of communication processes. The current experimental edition, which is a revision of an earlier (1961) edition, contains twelve subtests of which six are at the representational level and six are at the automatic level. Standardization of the test was done on "average" children ages two to ten years of age selected from middle socioeconomic communities in the Midwest and of predominantly Caucasian race.

Paraskevopoulos and Kirk (1969) have reported that the internal consistency coefficients were .87 for the composite ITPA in the five years, seven months to six years, one month age group of the normative group. Stability reliability of selected age ranges over five months time have indicated relatively equal pre-test and post-test scores with a stability coefficient of .70.

Since the ITPA by its nature is a clinical instrument that measures the child's psycholinguistic functioning in several areas, it possesses what might be termed "content" validity. The most appropriate validity study would probably be a longitudinal validation study consiting of clinical case studies over a period of time. Several authors, including Kirk and Bateman (1962), have presented data on the clinical usefulness of the ITPA.

For the purpose of this study, the following subtests at the automatic level of the ITPA were utilized.

Auditory Sequential Memory Subtest. This test involves the ability to reproduce from memory, immediately after presentation, sequences of stimuli which have been auditorily received. It consists of twenty-eight digit responses ranging in length from two to eight digits which are presented at the rate of two per second. The median internal

consistency coefficient is .90 for the eight age groups of average children in the standardization with a coefficient of .87 at the five years, seven months to six years, one month age level. The five month stability coefficient is .86 at the six year level. Difference scores between Auditory Memory and other subtests have median reliabilities ranging from .83 to .91 with a difference coefficient of .84 for this test with the Visual Memory subtest. The intercorrelations of Auditory Memory with other subtests range from .06 to .23 with an intercorrelation with Visual Memory of .16 across all age levels as well as for the age group 5-7 to 6-1.

Visual Sequential Memory Subtest. The test involves the ability to reproduce from memory sequences of visually received stimuli and is comprised of twenty-five sequences of discrete, non-meaningful, abstract figures varying in length from two through eight figures. The child would be shown each sequence of chips for five seconds and then asked to put chips of corresponding figures in the same order. Two trials per sequence were allowed where necessary as is the case with the Auditory Memory subtest.

Paraskevopoulos and Kirk (1969) have reported that the median internal consistency of this subtest is .82 for the eight age groups of average intelligence while the coefficient is .74 for the 5-7 to 6-1 age group and the five month stability coefficient for six year olds is .38. The median reliabilities of difference scores between Visual Memory and other subtests range from .72 to .84 with the correlation with Auditory Memory reported in the previous section.

The intercorrelations of Visual Memory and other subtests range from .08 to .28 with the highest correlations being with tests utilizing the visual channel.

Paraskevopoulos and Kirk (1969) have also summarized the relationship of several important variables and their effect on ITPA performance. Their data have indicated that the ITPA composite score has a correlation coefficient of .96 with chronological age while Auditory Memory and Visual Memory correlate .76 and .82 respectively.

In terms of sex differences, no significant differences favoring either girls or boys over the battery as a whole or in the Visual or Auditory Memory subtests were found. Social class differences and their effects on ITPA performance have indicated small but significant correlations with several subtests but insignificant correlations of .04 and -.09 were obtained from Auditory and Visual sequential Memory respectively. The negative correlation of Visual Memory with social class is actually a positive one and does indicate a slight tendency to be related to this variable.

When intelligence as measured by the Stanford-Binet is considered, the data of Paraskevopoulos and Kirk have indicated that the composite score and psycholinguistic quotient of the ITPA correlate higher with IQ and MA than any of the subtests. Auditory and Visual Memory along with the two supplementary tests were found to have the lowest correlations with MA and IQ. When the 5-7 to 6-1 age level is considered, Auditory Memory was found to have a correlation of .14 with MA, .13 with IQ while Visual Memory correlated .11 with MA, and .07 with IQ.

It appears that, based on the standardization sample data, Auditory and Visual Memory correlate highly with chronological age but do not

correlate significantly with sex, socioeconomic status, or IQ. This appears to be a further indication of their status as independent functions.

Ray Reading Methods Test (Experimental Edition)

The Ray Reading Methods Test (RRMT) Experimental Edition was developed to provide the teacher and/or clinician with a technique of evaluating the preferred learning method(s) of children in the process of beginning to read (Ray, 1970). In essence, this test resembles the widely used Learning Methods Test developed by Mills (1964). The Mills test was designed to be appropriate for seven, eight, and nine year old children who have already been exposed to reading instruction and have encountered difficulty in word recognition. Mills has provided a visual, auditory, kinesthetic, and combination approach to teaching word recognition with the preferred method often resulting in a significant difference in performance compared to the others. No provisions are made for younger subjects and an uncontrolled introduction of phonetic rules are employed which makes this test very difficult for younger children.

Ray has concluded from an evaluation of methods currently available to the teacher that there appears to be four methods of reading instruction in use. These methods are identified as the Visual-Auditory (Look-say), Auditory-Visual (Sound-Symbol), Linguistic Word Structure, and Linguistic-Language Experience. The RRMT was designed to evaluate the performance of children by measuring the response to teaching-learning experiences utilizing each of the four methods. The author has stated that if the child's raw score on the twenty-four hour test of recall is

seven or more out of a possible ten, the prognosis has been completed since a score of seven or more indicates that the child is predicted to be successful in this method. A score of less than seven is presumably indicative of a prognosis for difficulty and/or failure with this method.

Each of the four methods employs identical time allottments and instructional sequences, while the ten words to be taught and the specific teaching materials and procedures vary with the individual methods. The specific directions and procedures are to be found as Appendix B. The RRMT was designed to be appropriate for children ages four, five, and six and can be administered in groups up to five members or individuals.

No reliability or validity data are provided by the author of the RRMT in the test manual of the experimental edition. However, the RRMT possesses what is termed "face validity" or "work sample" validity. A panel of three "experts" in reading instruction were requested to evaluate the RRMT in terms of its rational or logical validity or to decide whether the RRMT appears to be a reasonable method to measure what the author is interested in. All three experts concluded that the RRMT possesses adequate face validity for use in this study.

In terms of reliability, Manwarren (1971) has reported that on a random sample of thirty first graders, split half reliability coefficients of .969 for the visual-auditory and .970 for the auditory-visual subtests were obtained. Both of these coefficients were higher than those obtained on the other two subtests of the RRMT in which coefficients of .908 for the Linguistic Word Structure and .954 for the Language Experience were found.

For the purposes of the present study, the Visual-Auditory (V-A) and the Auditory-Visual (A-V) portions of the RRMT were utilized since they were representative of the two most widely used approaches to beginning reading instruction in our schools. The test manual of the RRMT has provided the following descriptions of these two methods:

The Visual-Auditory Method. The Visual-Auditory Method of reading instruction is currently the most widely used method. In the initial stage of learning, the configuration of a total word is used for instruction with pictures and verbal context clues providing the vehicle of instruction. No sound-symbol associations are developed. The skill development program is dependent upon an accumulation of sight words from controlled vocabulary reading materials to be used later in an analytical approach to decoding. The transfer of decoding skills is delayed in general application, with the pace of skill development being slow. Learner strength requirements include: vision (acuity, identification, perception, memory) and visual-auditory integration. The basal reader programs are most typical of the Visual-Auditory method of reading instruction.

The specific directions and procedures for this method are presented in the test itself which is found in Appendix B.

The Auditory-Visual Method. The Auditory-Visual Method of reading instruction has the letter as the basic unit of instruction. Initially, the learner must accumulate a number of sound-symbol associations and utilize these in synthesizing, and thus decoding, words. Skill transfer is accomplished through the use of known sound-symbol associations applied to the unknown words. This transfer is effected early in words

where consistent sound-symbol patterns exist. The pace of decoding skill development is rapid.

Learner strength requirements are primarily auditory (acuity, identification, discrimination, perception, memory) with a secondary strength requirement of auditory-visual integration.

The specific directions and procedures for this method are also presented in Appendix B.

The scoring for both the V-A and A-V portions of the RRMT involves raw scores representing the number of words recalled at several time intervals both during and following the instructional periods.

Peabody Picture Vocabulary Test

The Peabody Picture Vocabulary Test (PPVT) developed by Dunn (1959) was used to obtain an estimate of the intellectual potential of the kindergarten subjects. The PPVT is individually administered test of hearing vocabulary or receptive word knowledge that was designed to predict school success of a standardization sample involving the ages two to eighteen years inclusive. The test itself requires the subject to identify the pictorial equivalent of a word given by the examiner from a group of four responses. It is easy to administer and score and usually takes about ten to fifteen minutes to complete.

Congruent validity studies comparing the PPVT with both the Stanford-Binet (SB) Form LM 1960, and the Wechsler Intelligence Scale for Children (WISC) are abstracted and provided in the test manual. Correlations with the 1960 Binet mental ages have ranged from 0.82 to 0.86 with a median of .83. In a recent study using boys and girls between the ages of six and nineteen years of age, O'Connor, Shatwell,

Galitt, and Ringman (1969) found through correlational analyses that the relation between the PPVT and S-B LM were relatively strong.

Dunn (1965) also reported that congruent validity data involving the Wechsler scale and PPVT are relatively strong. Correlations of the PPVT with the WISC full scale are reported over the range of .30 to .84 with a median of .61 while the correlations of the Verbal scale tend to be higher and Performance scale tend to be lower than the Full Scale IQ.

A recent study by Anderson and Flax (1968) involving children between the ages of six and thirteen indicated that the PPVT tends to correlate as highly with the Performance and Verbal scales as these two scales correlate with each other. Anderson concluded that except for averaging one to three points higher at some age levels, the PPVT appears to be quite comparable to the WISC.

In terms of predictive validity, two studies are reported in the manual which show positive but low correlations with school success. In view of the fact that both studies involved children at the beginning stages of reading and other subjects, Dunn concluded that probably visual discrimination and other factors are more important than hearing vocabulary in predicting school success at this age, and it is suggested that the PPVT would probably be a better predictor from grade three on. However, no data are presented to support this contention.

The reliability data provided by the authors in the test manual report alternate form reliability coefficients for raw scores ranging from a low of 0.67 at the six year level to a high of 0.84 at the seventeen and eighteen year level with a median of 0.77. The standard

error of measurement for IQ scores ranged from 6.00 to 8.61 with a median of 7.20.

At the five year level, the age of the large majority of the subjects of the present study, reliability coefficients of .73 with a standard error of 7.80 were reported in the manual.

In view of the above data and research, it appears that the PPVT is a valid and reliable measure of verbal intelligence that provides an efficient practical instrument to screen a large number of children on an individual basis.

Wepman Auditory Discrimination Test

The Wepman Auditory Discrimination Test (WADT) was developed to assess the child's ability to make speech-sound discriminations involved in human communication (Wepman, 1958). This widely used, individually administered test of auditory discrimination consists of forty pairs of words to which the child is required to say "same" or "different". Thirty of the pairs involve discrimination between words differing in initial, medial, or final consonant and vowel sounds, while ten of the word pairs are identical words which are used to judge the validity of the test.

Norms representing inadequate development in auditory discrimination are reported for children ages five through eight inclusive in the test manual. Standardization was on 533 unselected first, second, and third grade children in both urban and non-urban communities. Test-retest reliability is reported as .91 based on 109 children in the test manual.

Wepman found that discrimination as measured by the WADT was correlated with early reading scores. With intelligence held constant,

it was found that twenty-seven percent of eighty children in the first grade showed inadequate auditory discrimination and their reading scores were significantly below the reading level of children with adequate auditory discrimination.

In a comprehensive study of predictive factors in reading disability, De Hirsch, et al. (1966) found the WADT to be among the ten tests out of thirty-seven perceptuomotor and language ability tests given to kindergarteners, that were predictive of ten out of eleven children failing in reading in the second grade.

Validity studies reported in the test manual have indicated significant predictive validity between auditory discrimination and various methods of reading achievement as well as articulation disorders.

The specific reason for the inclusion of this test in the study was due to the need to know if adequate auditory discrimination ability was present in the experimental subjects. Since success on the auditory memory test of the ITPA may be partly due to the ability to discriminate between the digits, the test provided some assurance that an indicated weakness was due to memory ability rather that discrimination ability. This ability of auditory discrimination was also important for success on the A-V portion of the RRMT.

Developmental Test of Visual Perception

The Developmental Test of Visual Perception (DTVP) was developed by Frostig, et al. (1966) in order to provide a normative test of visual perception that would differentiate various kinds of perceptual abilities. The DTVP was standardized on white, middle class public

school children between the ages of four and seven inclusive. The test is made up of the following subtests: Eye-Motor Coordination, Figure-Ground, Constancy of Shape, Position in Space and Spatial Relationships.

Test-retest reliability of the total DTVP using the perceptual quotient are reported by Frostig, et al. (1964) to be .98 across all age groups while split-half reliability data range from .78 to .89 with a decline as age increases.

The author's research, as well as that by others, indicate that scores on the test correlate with reading achievement in the normal first grade classroom between .40 and .50.

The subtest selected for this study was the Position in Space subtest (PS) which is operationally defined by Frostig, et al. (1966, p. 4): "Position in Space - a test involving the discrimination of reversals and rotations of figures presented in series. Schematic drawings representing common objects are used."

Reliability data reported for this subtest indicate a test-retest product moment correlation of .60 for kindergarteners' scaled scores while split-half reliability is reported as .70 for the same age group.

The child with a deficiency in PS will probably find it very difficult and confusing when faced with letters and words in beginning reading. An example of the child with difficulty with perceiving the proper position of an object in relation to his body is seen in the child who perceives b as d and saw as was.

The selection of this test as an estimate of visual discrimination ability appears justified in view of the similarity of this subtest to widely used measures of reading readiness as seen in the Matching Subtest of the Metropolitan Readiness Test.

The specific reason for its inclusion in this study was due to the need to know if adequate visual discrimination ability was present in order to succeed on the Visual Memory subtest of the ITPA and the V-A portion of the RRMT since a child would have to discriminate between different geometric designs before memorizing them on the ITPA, and a failure in memory ability could be related to poor discrimination rather than memory per se.

Major Experimental Hypotheses

The research questions raised in Chapter I were transformed into operational terms and stated in null form as follows:

Hypothesis I: There will be no significant difference between the experimental groups on immediate recall (IR) with the V-A method.

Hypothesis II: There will be no significant differences between the experimental groups on delayed recall (DR) with the V-A method.

Hypothesis III: There will be no significant differences between the experimental groups on IR with the A-V method.

Hypothesis IV: There will be no significant differences between the experimental groups on DR with the A-V method.

Hypothesis V: There will be no significant differences between the experimental groups on IR of the V-A method when the order of treatments are considered.

Hypothesis VI: There will be no significant differences between the experimental groups on DR of the V-A method when the order of treatments are considered.

Hypothesis VII: There will be no significant differences between the experimental groups on IR of the A-V method when the order of treatments are considered.

Hypothesis VIII: There will be no significant differences between the experimental groups on DR of the A-V method when the order of treatments are considered.

Minor Statistical Hypotheses

Hypothesis IX: There will be no significant differences between the experimental groups in auditory discrimination errors on the WADT.

Hypothesis X: There will be no significant differences between the experimental groups in visual discrimination success on the DTVP.

Statistical Analysis of the Data

A single classification analysis of variance was used to test Hypotheses I through IV inclusive and Hypotheses IX and X.

A multiple classification analysis of variance was used to test Hypotheses V through VIII inclusive. In these four hypotheses, two independent variables, the experimental groups and order effects, were tested for their effects on the IR and DR with both V-A and A-V methods.

The two basic assumptions of the analysis of variance test are that the subgroup categories are randomly drawn and that the variance between these subgroups are homogeneous (Popham, 1967).

The test yields a statistic

$$F = \frac{\overline{SS}_g}{\overline{SS}_w}$$

The .05 level of confidence was required for statistical significance.

In those cases where a significant F was obtained, the Sheffé test was used to locate those means that were significantly different from each other. This test used the F statistic already computed as follows:

$$F_{\text{between pairs}} = \frac{(\bar{x}_a - \bar{x}_b)^2}{\overline{ss}_w \; (n_a + n_b)} \Big/ (n_a)\;(n_b)$$

The value obtained is designated F' and is found as follows:

$$F' = F_{table}(k-1)$$

CHAPTER IV

ANALYSIS OF THE DATA

Restatement of the Purpose of the Study

The purpose of this study was to determine the effects of selected patterns of visual and auditory memory abilities on kindergarteners' word recognition success under two methods of teaching beginning reading. The Visual-Auditory (Look-say) and Auditory-Visual (Sound-symbol) methods of teaching reading were utilized and measures of both immediate and delayed recall were used as criteria for learning and retention.

Organization of the Chapter

This chapter presents a discussion of the results of the analysis of the data. The first part of this chapter involves a description of the characteristics of the experimental subjects and groups.

The largest portion of this chapter involves a restatement of the research hypotheses formulated at the end of the preceding chapter followed by the results of a statistical analysis of the data relevant to each hypothesis. A short discussion of the findings for each hypothesis are presented as well as an overall summary of the findings at the end of the chapter.

A single classification analysis of variance was used to analyze the data relevant to Hypotheses I through IV inclusive involving the

effects of memory abilities on word recognition success under each teaching method considered separately. A pilot study involving a comparison of learning rates under the Visual-Auditory and Auditory-Visual methods indicated that the Auditory-Visual method was intrinsically more difficult than the Visual-Auditory method irregardless of learner abilities. The results of the present study were in agreement with the pilot study and this finding necessitated separate consideration of learning under both methods since they were apparently not "equivalent" tasks.

A multiple classification analysis of variance was used to analyze the data regarding memory abilities and word recognition success when order of treatments was considered. Since each experimental subject received both teaching methods over a two-week period, the effects of receiving one prior to the other (order) was considered to be an independent variable that might interact with selected memory ability subgroups.

The two minor hypotheses, IX and X were analyzed through the use of a single classification analysis of variance procedure.

In all cases where a significant difference between means were found, the Sheffe' test described at the end of the preceding chapter was used to locate significant mean differences.

Description of the Experimental Subjects

In Table VI, a description of the characteristics of the experimental subjects in each subgroup is presented. An examination of this table indicates that on those variables that no significant differences would be expected, chronological age, IQ, and Auditory and Visual

TABLE VI

MEANS AND STANDARD DEVIATIONS OF THE EXPERIMENTAL GROUPS ON SELECTED VARIABLES

	Groups		
	AV-LA (n=17)	AA-LV (n=18)	AV-AA (n=17)
Chronological age at time of teaching (in months)	66.9 3.01	73.2 3.90	70.9 2.96
IQ (PPVT)	97.4 11.72	103.5 5.95	101.8 10.58
Visual Memory Scaled Score (ITPA)	38.2 3.29	26.8 4.75	35.7 2.09
Auditory Memory Scaled Score (ITPA)	28.9 1.28	41.0 6.25	36.2 2.38
Auditory Discrimination Errors (Wepman)	6.8 2.98	4.8 2.01	5.6 2.86
Visual Discrimination Scores (Frostig)	6.1 1.04	6.1 1.32	6.4 .89

Discrimination scores, there appears to be little actual difference with the exceptions of chronological age and IQ. The fact that the AV-LA group was lowest on both of these variables is discussed further in Chapter V.

In Table VII, the number of "complete" and "incomplete" subjects for each subgroup is presented. Since an identical subjects design was employed, only those subjects who were present for the entire portion of both teaching methods were considered to be complete. An "incomplete" subject was considered "lost" in that the results for one method were not included in the analyses of the research hypotheses.

TABLE VII

NUMBER OF "COMPLETE" AND "INCOMPLETE" SUBJECTS IN EACH EXPERIMENTAL GROUP

	Group			
	AV-LA	AA-LV	AV-AA	Total
Complete	17	18	17	52
Incomplete	3	8	9	20
Total	20	26	26	72

Findings Pertaining to Hypothesis I

Hypothesis I: There will be no significant difference between the experimental groups on immediate recall (IR) with the V-A method.

An examination of Table VIII indicated that there was no significant difference between the experimental groups in terms of their performance on the immediate recall portion of the Visual-Auditory method of the RRMT. From this analysis, it is evident that having an adequate visual memory (AV-LA) but a low auditory memory does not result in a significant difference in performance on a primarily visual task when compared with a group that had a low visual memory but adequate auditory memory (AA-LV) or adequacy in both abilities (AV-AA). This finding prevailed despite the higher mean immediate recall scores of both groups having adequate visual memory.

Findings Pertaining to Hypothesis II

Hypothesis II: There will be no significant difference between the experimental groups on delayed recall (DR) with the V-A method.

An examination of Table IX revealed that the three experimental groups did not differ significantly on their performance on DR of the V-A method. Apparently, having an adequate visual memory but low auditory memory (AV-LA) or adequacy in both memory abilities (AV-AA) did not result in significantly greater word recognition success than those with low visual memory but adequate auditory memory (AA-LV) even though this was primarily a visual task. This was evident despite the fact that both groups having adequate visual memory exceeded the low visual memory group in mean numbers of words recalled.

TABLE VIII

EFFECTS OF SELECTED PATTERNS OF MEMORY ABILITIES ON IMMEDIATE RECALL (IR) WITH THE VISUAL-AUDITORY (V-A) METHOD

	Treatment Group		
	AV-LA	AA-LV	AV-AA
Sample Size	17	18	17
Mean	15.9	11.17	16.3
Standard Deviation	7.9	7.1	6.7

ANALYSIS OF VARIANCE

Source of Variation	Df	Sum of Squares	Mean Sum of Squares	F
Between Groups	2	239.21	119.63	2.27 n.s.
Within Groups	49	2577.52	52.61	
Total	51	2816.75		

F 2.27 $<$ .05 $F_{2,49}$ 3.18
Decision: Accept null hypothesis.

TABLE IX

EFFECTS OF SELECTED PATTERNS OF MEMORY ABILITIES ON DELAYED RECALL (DR) WITH THE VISUAL-AUDITORY (V-A) METHOD

	Treatment Group		
	AV-LA	AA-LV	AV-aa
Sample Size	17	18	17
Mean	8.2	5.9	7.0
Standard Deviation	4.20	3.62	4.15

ANALYSIS OF VARIANCE

Source of Variation	Df	Sum of Squares	Mean Sum of Squares	F
Between Groups	2	50.85	24.43	1.74 n.s.
Within Groups	49	714.34	14.61	
Total	51	765.19		

F 1.74 < .05 F 2,49 3.18
Decision: Accept null hypothesis.

Findings Pertaining to Hypothesis III

Hypothesis III: There will be no significant difference between the experimental groups on immediate recall (IR) with the A-V method.

The results of this analysis of variance (Table X) have indicated that there was no significant difference between the three groups on their performance on IR of the A-V method. This indicated that those subjects that had adequate auditory memory but low visual memory (AA-LV) failed to perform significantly better on a primarily auditory task than those with low auditory memory and adequate visual memory (AV-LA) or those with adequacy in both modalities.

Findings Pertaining to Hypothesis IV

Hypothesis IV: There will be no significant differences between the experimental groups on delayed recall (DR) with the A-V method.

An analysis of Table XI indicated that there was no significant difference between the experimental groups on DR of the A-V method. It is evident that there was no significant difference between those groups having adequate auditory memory (AA-LV and AV-AA) and the group with low auditory memory (AV-LA) on this primarily auditory task.

Findings Pertaining to Hypothesis V

Hypothesis V: There will be no significant differences between the experimental groups on IR of the V-A method when the order of treatments is considered.

An examination of the multiple analysis of variance of Table XII indicated that there were significant main effects for the variable,

TABLE X

EFFECTS OF SELECTED PATTERNS OF MEMORY ABILITIES ON IMMEDIATE RECALL (IR) WITH THE AUDITORY-VISUAL (A-V) METHOD

	Treatment Group		
	AV-LA	AA-LV	AV-AA
Sample Size	17	18	17
Mean	5.9	6.4	7.8
Standard Deviation	5.40	4.25	3.58

Analysis of Variance

Source of Variation	Df	Sum of Squares	Mean Sum of Squares	F
Between Groups	2	25.32	12.21	.601 n.s.
Within Groups	49	993.73	20.31	
Total	51	1019.05		

F .601 < .05 F 2,49 3.18
Decision: Accept null hypothesis.

TABLE XI

EFFECTS OF SELECTED PATTERNS OF MEMORY ABILITIES ON DELAYED RECALL (DR) WITH THE AUDITORY-VISUAL (A-V) METHOD

	Treatment Group		
	AV-LA	AA-LV	AV-AA
Sample Size	17	18	17
Mean	2.93	3.25	3.91
Standard Deviation	2.34	2.54	1.94

Analysis of Variance

Source of Variation	Df	Sum of Squares	Mean Sum of Squares	F
Between Groups	2	9.63	4.81	.941 n.s.
Within Groups	49	250.42	5.13	
Total	51	260.05		

F .941 < .05 F 2,49 3.18
Decision: Accept null hypothesis.

TABLE XII

EFFECTS OF SELECTED PATTERNS OF MEMORY ABILITIES AND ORDER OF TREATMENTS ON IMMEDIATE RECALL (IR) WITH THE VISUAL-AUDITORY (V-A) METHOD

Order		Treatment Groups AV-LA	AA-LV	AV-AA	Total Sample Size
	Sample Size	10	10	6	26
V-A, A-V	Mean	16.4	14.0	20.8	
	Standard Deviation	8.51	6.31	3.94	
	Sample Size	7	8	11	26
A-V, V-A	Mean	15.6	8.8	13.8	
	Standard Deviation	7.45	7.38	5.89	
Total Sample Size		17	18	17	52

Analysis of Variance

Source of Variation	df	Sum of Squares	Mean Sum of Squares	F
Groups	2	239.5	119.70	3.02 n.s.
Order	1	184.4	184.40	4.64*
Interaction (Groups x Order)	2	556.0	278.00	7.00**
Within	46	1826.1	39.69	
Total	51	2806.0		

F 4.64 $>$ .05 F 1,46 4.05* F 3.02 $<$ .05 F 2,46 3.20
F 7.00 $>$ .01 F 2,46 5.10**
Decision: Reject null hypothesis

order of treatments, and significant interaction effects for the variables, groups and order of treatments, taken together. The results for the analysis of the variable, groups or memory abilities, failed to reach significance at the .05 level.

Since the significant F values for order and interaction effects only indicated that two or more of the subgroup means were significantly different, a Sheffé test for mean differences was performed and the results are reported in Table XIII.

An examination of Table XIII revealed that one pair of means out of a possible number of six pairs reached significance in the case of order effects. When the upper portion of Table XII is referred to, this significant pair of means was identified as the AV-LA and AA-LV groups with order A-V, V-A. Evidently, in terms of IR with the V-A method, those subjects having adequate visual memory and low auditory memory (AV-LA) recognized significantly more words than those with adequate auditory memory and low visual memory (AA-LV) when both groups had been previously taught with the A-V method.

When the interaction effects are considered in Table XIII, two of the six pairwise comparisons of means reached statistical significance. Referring back to Table XII, these significant comparisons were located as involving the AV-LA and AV-AA groups receiving the V-A, A-V order of treatments and the AA-LV group receiving the A-V, V-A order of treatments. In other words, both groups with adequate visual memory had significantly greater word recognition success than the group having low visual memory on the immediate recall portion of a primarily visual task (V-A) method. However, both of these adequate visual memory groups had received the V-A method first while the low visual memory group had

TABLE XIII

PAIRWISE COMPARISONS OF MEANS FOR SIGNIFICANT ORDER EFFECTS AND INTERACTION FROM TABLE XII

Effects of Order

Comparison	F value	Decision
$\overline{X}_1$ & $\overline{X}_2$	.72	n.s.
$\overline{X}_1$ & $\overline{X}_3$	1.60	n.s.
$\overline{X}_2$ & $\overline{X}_3$	3.82	n.s.
$\overline{X}_4$ & $\overline{X}_5$	4.35	$p < .05$
$\overline{X}_4$ & $\overline{X}_6$	.35	n.s.
$\overline{X}_5$ & $\overline{X}_6$	2.82	n.s.

$F' = .05\ F_{1,46}\ \ 4.05\ (r-1)$
$F' = 4.05\ (1)$
$F' = 4.05$

Interaction (Groups x Order)

Comparison	F value	Decision
$\overline{X}_1$ & $\overline{X}_5$	10.32	$p < .05$
$\overline{X}_1$ & $\overline{X}_6$	.89	n.s.
$\overline{X}_2$ & $\overline{X}_4$	.27	n.s.
$\overline{X}_2$ & $\overline{X}_6$	.01	n.s.
$\overline{X}_3$ & $\overline{X}_4$	2.28	n.s.
$\overline{X}_3$ & $\overline{X}_5$	12.44	$p < .05$

$F' = .05\ F_{2,46}\ \ 3.20\ (r-1)\ (k-1)$
$F' = 3.20\ (2)$
$F' = 6.40$

received the A-V method prior to the present task. Apparently, having had the A-V method first resulted in poorer performance for all groups, but in the case of the low visual memory group (AA-LV), this resulted in significantly poorer performance.

Findings Pertaining to Hypothesis VI

Hypothesis VI: There will be no significant differences between the experimental groups on DR of the V-A method when order of treatments is considered.

The results of Table XIV indicated that there were no significant main effects for patterns of memory abilities (groups) or sequence of teaching methods (order). There was a significant interaction effect for groups and order and a pairwise comparison shown in Table XV indicated that significant means were found in one of the six possible pairs with one other pair very close to statistical significance.

An examination of Table XIV indicated that there was a significant interaction between the adequate visual and adequate auditory group (AV-AA) receiving the V-A, A-V order and the A-V, V-A order.

This finding was similar to the interaction finding in the previous hypothesis in which both groups having adequate visual memory and receiving the V-A method first did significantly better than the low visual memory group receiving the V-A method after the A-V method. In the present hypothesis, however, the comparison between the AV-LA group with the V-A, A-V order and the AA-LV group with the A-V, V-A order missed statistical significance by a relatively small margin.

TABLE XIV

EFFECTS OF SELECTED PATTERNS OF MEMORY ABILITIES AND ORDER OF TREATMENTS ON DELAYED RECALL (DR) WITH THE VISUAL-AUDITORY (V-A) METHOD

Order		Treatment Groups AV-LA	AA-LV	AV-AA	Total Sample Size
	Sample Size	10	10	6	26
V-A, A-V	Mean	8.6	7.0	9.5	
	Standard Deviation	4.45	3.51	1.63	
	Sample Size	7	8	11	26
A-V, V-A	Mean	7.7	4.5	7.3	
	Standard Deviation	4.31	4.78	6.72	
Total Sample Size		17	18	17	52

Analysis of Variance

Source of Variation	df	Sum of Squares	Mean Sum of Squares	F
Groups	2	60.4	30.20	2.66 n.s.
Order	1	35.6	35.60	3.13 n.s.
Interaction (Groups x Order)	2	110.5	55.25	4.87*
Within	46	522.6	11.36	
Total	51	729.1		

F 2.66 < .05 F 2,46 3.20
F 3.13 < .05 F 1,46 4.05
F 4.87 > .05 F 2,46 3.20*
Decision: Reject null hypothesis

TABLE XV

PAIRWISE COMPARISONS OF MEANS FOR SIGNIFICANT INTERACTION FROM TABLE XIV

Interaction (Groups x Order)		
Comparison	F value	Decision
$\overline{X}_1$ & $\overline{X}_5$	6.04	n.s.
$\overline{X}_1$ & $\overline{X}_6$	.78	n.s.
$\overline{X}_2$ & $\overline{X}_4$	.01	n.s.
$\overline{X}_2$ & $\overline{X}_6$	.04	n.s.
$\overline{X}_3$ & $\overline{X}_4$	.92	n.s.
$\overline{X}_3$ & $\overline{X}_5$	7.86	$p < .05$

Findings Pertaining to Hypothesis VII

Hypothesis VII: There will be no significant differences between the experimental group on IR of the A-V method with order considered.

A consideration of Table XVI indicated that both main effects of groups and order and interaction failed to reach statistical significance. These results indicated that having adequate auditory memory (AV-LV, AV-AA) did not result in significantly better word recognition success than the group with low auditory memory (AV-LA) on a primarily auditory task when order of treatments was considered.

Findings Pertaining to Hypothesis VIII

Hypothesis VIII: There will be no significant differences between the experimental groups on DR of the A-V method when order of treatments are considered.

TABLE XVI

EFFECTS OF SELECTED PATTERNS OF MEMORY ABILITIES AND ORDER OF TREATMENTS ON IMMEDIATE RECALL (IR) WITH THE AUDITORY-VISUAL METHOD (A-V)

Order		Treatment Groups AV-LA	AA-LV	AV-AA	Total Sample Size
	Sample Size	10	10	6	26
V-A, A-V	Mean	7.1	7.3	9.3	
	Standard Deviation	5.12	5.02	3.84	
	Sample Size	7	8	11	26
A-V, V-A	Mean	4.3	5.3	7.0	
	Standard Deviation	5.90	2.79	3.34	
Total Sample Size		17	18	17	52

Analysis of Variance

Source of Variation	Df	Sum of Squares	Mean Sum of Squares	F
Groups	2	35.7	17.85	1.01 n.s.
Order	1	50.0	50.00	2.81 n.s.
Interaction (Groups x Order)	2	104.9	52.94	2.95 n.s.
Within	46	819.1	17.80	
Total	51	1009.7		

F 1.01 < .05 F 2,46 3.20
F 2.81 < .05 F 1,46 4.05
F 2.95 < .05 F 2,46 3.20
Decision: Accept null hypothesis

An examination of Table XVII indicated that there were no significant differences in mean delayed recall scores of the three subgroups when order of treatments was considered and that there was no significant interaction between the groups and order of treatments.

It was concluded that having adequate auditory memory ability did not result in significantly better delayed recall on a primarily auditory task even when the order of presentation of treatments was considered.

Findings Pertaining to Hypothesis IX

Hypothesis IX: There will be no significant differences between the experimental groups in auditory discrimination errors on the WADT.

An examination of Table XVIII indicated that although the two groups having adequate auditory memory ability (AA-LV and AV-AA) had lower mean errors than the group with low auditory memory ability (AV-LA), there was no significant difference between their performance on the auditory discrimination task. In other words, there were no significant differences among the three groups in auditory discrimination ability despite their differences in auditory memory. In addition, all of the groups were within the normative expectancy of five to six errors for this age group with the possible exception of the AV-LV group which had a mean error score close to 7.0.

Findings Pertaining to Hypothesis X

Hypothesis X: There will be no significant differences between the experimental groups in visual discrimination success on the DTVP.

TABLE XVII

EFFECTS OF SELECTED PATTERNS OF MEMORY ABILITIES AND ORDER OF TREATMENTS ON DELAYED RECALL (DR) WITH THE AUDITORY-VISUAL (A-V) METHOD

Order		Treatment Groups AV-LA	AA-LV	AV-AA	Total Sample Size
	Sample Size	10	10	6	26
V-A, A-V	Mean	3.3	3.6	4.0	
	Standard Deviation	1.69	3.23	1.08	
	Sample Size	7	8	11	26
A-V, V-A	Mean	2.4	2.6	3.9	
	Standard Deviation	2.93	1.41	2.33	
Total Sample Size		17	18	17	52

Analysis of Variance

Source of Variation	Df	Sum of Squares	Mean Sum of Squares	F
Groups	2	9.5	4.75	.96 n.s.
Order	1	2.7	2.70	.53 n.s.
Interaction (Groups x Order)	2	16.8	8.40	1.65 n.s.
Within	46	230.8	5.13	
Total	51	259.8		

F .96 < .05 F 2,46 3.20
F .53 < .05 F 1,46 4.05
F 1.65 < .05 F 2,46 3.20
Decision: Accept null hypothesis

TABLE XVIII

EFFECTS OF SELECTED PATTERNS OF MEMORY ABILITIES ON AUDITORY DISCRIMINATION ERRORS

	Treatment Group		
	AV-LA	AA-LV	AV-AA
Sample Size	17	18	17
Mean	6.8	4.8	5.6
Standard Deviation	2.98	2.01	2.86

Analysis of Variance

Source of Variation	Df	Sum of Squares	Mean Sum of Squares	F
Between Groups	2	34.4	17.20	2.46 n.s.
Within Groups	49	342.9	7.03	
Total	51	377.3		

F 2.46 < .05 F 2,49 3.18
Decision: Accept null hypothesis

An analysis of variance of the data relative to the present hypothesis has indicated that no significant differences were found between the performances of the three groups on a test of visual discrimination ability. In addition, all of the groups were well within the normative expectancy for this age group of five to six correct responses out of a possible eight.

It can be concluded that adequate visual discrimination ability was present for all groups and that no one group was significantly superior to the others in visual discrimination ability as measured by the DTVP subtest of Position in Space.

Summary of Findings

The findings of this chapter are as follows:

1. No significant differences were found between the three groups, having selected patterns of memory abilities, in their word recognition success on immediate recall (IR) or delayed recall (DR) of the Visual-Auditory (Look-say) or Auditory-Visual (Sound-symbol) methods. Hypothesis I through Hypothesis IV inclusive could not be rejected on the basis of the data presented.

2. When order of treatments was considered along with groups of memory abilities (Hypothesis V), a significant order effect was found with immediate recall of the Visual-Auditory method. This significant finding involved the adequate visual and low auditory group learning more effectively than the adequate auditory and low visual group when they both received the Auditory-Visual method prior to the Visual-Auditory method. Significant interaction was also found between those groups having adequate visual memory (AV-LA, AV-AA) and receiving the

TABLE XIX

EFFECTS OF SELECTED PATTERNS OF MEMORY ABILITIES ON VISUAL DISCRIMINATION SUCCESS

	Treatment Groups		
	AV-LA	AA-LV	AV-AA
Sample Size	17	18	17
Mean	6.1	6.1	6.4
Standard Deviation	1.04	1.32	.89

Analysis of Variance

Source of Variation	Df	Sum of Squares	Mean Sum of Squares	F
Between Groups	2	.91	.450	.362 n.s.
Within Groups	49	60.6	1.234	
Total	51	61.51		

F .362 $<$ .05 F 2,49 3.18
Decision: Accept null hypothesis

V-A method first and the group having adequate auditory and low visual memory and receiving the A-V method prior to the V-A method.

3. In regards to delayed recall with the Visual-Auditory method (Hypothesis VI), no significant main effects were found but significant interaction of groups and order was found. The group having adequacy in both memory abilities (AV-AA) and receiving the V-A method first performed significantly better than the adequate auditory and low visual memory group (AA-LV) which received the A-V method before the V-A method. A strong but non-significant tendency for the AV-LA group which received the V-A method first to also do better than the AA-LV group was also found.

4. When the Auditory-Visual method was considered, no main effects for groups and order of treatments or interaction effects were found to be statistically significant. Therefore, Hypothesis VII and Hypothesis VIII could not be rejected on the basis of the data presented.

5. The hypothesis regarding the effects of memory abilities on auditory discrimination errors, Hypothesis IX, and visual discrimination success, Hypothesis X, failed to reach statistical significance and could not be rejected.

6. The reader is cautioned that the interaction referred to in findings two and three above may constitute a type four error in analysis of variance in that there is a lack of commonality in the interaction.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to examine the effects of selected patterns of visual and auditory memory abilities on kindergarteners' word recognition success under two teaching methods. The research evidence reported in the literature regarding deficits in visual and auditory memory abilities in disabled readers provided a rationale for investigating these "integrational" type functions in children who have not yet begun to read. The possible role of modality based learning preference was investigated by providing a measure of learning effectiveness under both the Visual-Auditory and Auditory-Visual methods of reading instruction.

The total population of 362 kindergarteners in a middle class semi-rural city of 26,000 people in north central Oklahoma were given the Visual and Auditory Sequential Memory subtests of the ITPA and the Peabody Picture Vocabulary Test during the fall and winter of 1970-1971.

On the basis of the ITPA visual and auditory memory scaled scores, three experimental groups were arbitrarily defined as adequate visual memory and low auditory memory (AV-LA), adequate auditory memory and low visual memory (AA-LV), and adequate visual memory and adequate

auditory memory (AV-AA). Further criteria for inclusion in the study involved an IQ between 80 and 120, visual and auditory sensory adequacy, and non-reader status. All available subjects were randomly assigned to teaching groups of five subjects in each of fourteen kindergarten classes throughout the city.

Each of the experimental subjects were also given the Wepman Auditory Discrimination Test and Position in Space subtest of the Frostig Developmental Test of Visual Perception prior to receiving the experimental treatments.

The order of presentation of teaching methods was counterbalanced throughout the fourteen experimental groups. The Ray Reading Methods Test (Experimental Edition), Visual-Auditory (Look-say) and Auditory-Visual (Sound-symbol) portions were administered during the late winter and spring, 1970-1971, to all experimental subjects. Both immediate and delayed recall scores were obtained with each method in an identical subjects treatments by levels design. Only those subjects on which "complete" data for both methods were included in statistical analysis.

Using an analysis of variance statistical procedure with the .05 level required for significance, the following results were found:

1. There was no significant difference between memory ability groups on immediate and delayed recall of either the Visual-Auditory or Auditory-Visual methods.

2. When order of treatments were considered along with memory ability groups, significant order effects and interaction effects were found for immediate recall of the Visual-Auditory method. Only a significant interaction effect was found with delayed recall on the V-A method.

3. There were no significant main effects or interaction effects on immediate and delayed recall of the Auditory-Visual method when order of treatments was considered.

4. There were no significant differences between groups having selected patterns of memory abilities on auditory discrimination errors or visual discrimination success.

Conclusions

The literature discussed and reviewed in Chapters I and II indicated that a persistent characteristic of disabled readers was their difficulty in auditory and visual memory and sequencing abilities among other variables. Several studies have also suggested that these deficits probably do not develop as a result of reading failure but precede such failure. In addition, several authors have indicated the desirability of identifying modality based learning preferences in children. The research supporting this concept has been limited and inconclusive thus far.

The results of this study have indicated that no significant differences were found between the three groups having selected patterns of visual and auditory memory abilities on either immediate or delayed recall of the Visual-Auditory or Auditory-Visual methods.

Since the group having adequate auditory and visual memory ability (AV-AA) served as a type of "control" group, in that no memory deficits as measured by the ITPA were present, the non-significant performance of this group on all measures is surprising. This group had the largest mean score in eight of the twelve comparisons made but none reached significance statistically.

The failure of the AV-LA group to perform significantly better than the AA-LV group on the V-A method was also surprising in view of the fact that the AV-LA group exceeded the AA-LV group on all six of the mean comparisons relating to performance on the Visual-Auditory method. Although the mean comparisons were in the direction expected on the basis of modality preferences, their failure to reach significance might be due to the fact that the AV-LA subjects were on the average 6.3 months younger and had an IQ score 6.1 points lower than the AA-LV groups as indicated previously in Table VI. Both the variables of age and intelligence have been identified as being related to reading success and they may have accounted for the non-significant superiority of the AV-LA group.

The AA-LV group did not do significantly better on the Auditory-Visual method in comparison to the AV-LA group and the AV-AA groups. However, their mean performance was superior to the AV-LA group on all of the six comparisons made between means on immediate and delayed recall of the A-V method but were less than the means of the AV-AA group on all six of the same comparisons. It appears that there is again some limited support in the direction of modality based learning in view of the fact that the group with adequate auditory memory (AA-LV) exceeded the group with low auditory memory (AV-LA) on all six comparisons on a primarily auditory task.

It is interesting and possibly important to note that on all four of the comparisons involving order of treatments (Hypothesis V through Hypothesis VIII inclusive) in which a total of twelve mean comparisons can be made, the groups having received the Visual-Auditory method prior to Auditory-Visual method exceeded the groups having had the

reverse order (A-V, V-A) in all twelve cases. This was true despite the fact that the main effect of order reached significance in only one of the four hypotheses (Hypothesis V). However, it is not possible to suggest the advisability of beginning reading instruction with a look-say approach (V-A) method and developing a large sight vocabulary prior to beginning phonics instruction on the basis of this data.

As already indicated in the findings of this study, those groups with adequate visual memory (AV-LA and AV-AA) and receiving the V-A method prior to the A-V method did significantly better than the AA-LV group who received the A-V method first on immediate and delayed recall of the V-A method. Apparently, the exposure to the A-V method acted in a manner similar to a negative transfer effect. Since all groups did poorer in all cases where they had received the A-V method first, the findings that the AA-LV group did significantly poorer was probably due to their low visual memory on a primarily visual task in addition to the order effect. This would seem to offer tentative and limited support for the role of visual memory in beginning reading.

The poorer performance of all groups on the Auditory-Visual method indicated that the task was intrinsically harder than the Visual-Auditory method. The large number of zero scores obtained on both the immediate and delayed recall portions of this method, irrespective of group, offers further support for this finding. It may have been that this task or method was too difficult in terms of the requisite sub-skills that are believed to be required for success in this method as Chalfant and Scheffelin (1969) have pointed out in Chapter II. The Visual-Auditory method appears to make less demands on the learner and

this probably accounts for the greater discrimination ability of this test.

It is also possible that any meaningful measure of learning under the Auditory-Visual method with non-reading kindergarten subjects might have to involve what Bateman (1967a) has termed "stage one" of reading under the phonetic method. At this stage of phonics instruction, sound-symbol associations are learned without any necessary attempt at blending of the sounds to form meaningful words.

The fact that the experimental groups did not differ significantly in two such sub-skills, auditory discrimination and visual discrimination ability, suggests that any differences found in performance on the V-A method and A-V method were probably not due to differences in these sub-skills.

In summary, the findings of this study were essentially negative in that effects of memory abilities on word recognition success were for the most part not supported. Several significant findings for order effects and interaction were discussed and evaluated. Several important "trends" or "tendencies" in the data, although not statistically significant, were considered significant from an educational point of view and worthy of further study.

Recommendations for Further Research

Since failure to confirm findings suggested by previous research does not necessarily invalidate the previous research or even the present experimental endeavor, one of the important returns of well designed and well conducted research are the directions for future

research that are suggested. The following suggestions are made for further exploration of the main dimensions of the present study:

1. A replication of the present study using larger numbers in the sub-groups and employing controls for differences in age and intelligence to keep the groups as similar as possible.

2. Inclusion of children with both auditory and visual memory abilities being high or both being low in addition to the three groups already utilized. Since both of these abilities have been shown to be closely related to intelligence, an analysis of covariance technique will probably have to be employed.

3. Modification of the Auditory-Visual method of the Ray Reading Methods Test to allow for sub-skill requisites that would appear to be required for success. A related modification might utilize high meaningfulness stimulus words as opposed to the comparatively low meaningfulness stimulus words now utilized. In addition, the several modifications made in the present study and described in Chapter III were felt to be helpful in terms of improving the usefulness of this test.

The possibility of having this test consist solely of learning sound-symbol associations in a manner suggested by Bateman (1967a) should also be considered.

4. A closer evaluation of the Auditory Sequential Memory subtest of the ITPA in terms of the many apparent "higher scores" and overall superior performance compared to the Visual Sequential Memory subtest. Bateman (1967b) has also found this superiority in a high IQ population of kindergarteners.

5. Further investigation of the possibility of modality based learning in beginning reading instruction utilizing more comparable tasks in the Visual and Auditory modalities.

6. Further investigation of the role of auditory and visual sequencing deficits in terms of beginning reading instruction using different modality instruments or measures such as the Detroit Tests of Learning Aptitude.

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APPENDIX A

RAW DATA OF THIS STUDY

AV-LA GROUP

(1) S	(2) Sex	(3) Chron Age Mo.	(4) I.Q.	(5) Vis Mem s.s.	(6) Aud Mem s.s.	(7) Diff A-V	(8) WADT Errors	(9) DTVP Score	(10) V-A IR	(11) Method DR	(12) A-V IR	(13) Method DR	(14) Order 1(V-A,A-V) 2(A-V,V-A)
"Complete" Subjects													
1	M	68	114	41	27	14	8	7	8	4	5	3	1
2	M	75	115	36	30	6	10	8	17	11	16	5	1
3	M	73	110	38	27	11	7	6	15	7	3	2	2
4	M	74	87	39	30	9	11	7	26	13	12	6	1
5	M	72	85	33	27	6	6	6	2	1	1	1	1
6	M	66	84	34	27	7	7	4	13	7	1	3	1
7	M	74	95	36	30	6	4	6	11	4	3	2	1
8	M	77	97	44	30	14	7	6	21	10	8	3	1
9	M	72	80	46	28	18	1	7	11	9	4	1	1
10	M	71	93	39	30	9	3	5	25	13	9	5	1
11	F	78	112	39	28	11	8	7	10	5	3	1	2
12	F	73	112	37	30	7	11	6	8	3	0	1	2
13	F	71	91	36	29	7	10	5	9	4	2	1	2
14	F	74	95	36	30	6	3	6	24	13	4	2	2
15	F	71	85	38	29	9	4	5	16	8	1	1	2
16	F	76	108	40	30	10	7	7	27	14	17	9	2
17	F	73	93	37	30	7	9	5	28	14	12	4	1
"Incomplete" Subjects													
18	M	76	91	37	30	7	11	7	3	3	-	-	2
19	F	67	86	41	28	13	6	3	10	6	-	-	1
20	F	74	85	36	29	7	2	7	29	15	-	-	2

AA-LV GROUP

(1) S	(2) Sex	(3) Chron Age Mo.	(4) I.Q.	(5) Vis Mem s.s.	(6) Aud Mem s.s.	(7) Diff A-V	(8) WADT Errors	(9) DTVP Score	(10) V-A IR	(11) Method DR	(12) A-V IR	(13) Method DR	(14) Order 1(V-A,A-V) 2(A-V,V-A)
"Complete Subjects"													
1	M	72	106	16	51	35	7	4	8	5	7	4	2
2	M	76	89	30	36	6	7	7	16	11	8	5	1
3	M	75	97	30	43	13	7	7	20	8	13	2	1
4	M	68	106	26	43	17	8	4	4	2	5	2	2
5	M	77	91	29	37	8	5	6	14	6	12	10	1
6	M	76	80	23	33	10	6	5	3	0	1	1	2
7	M	72	106	29	35	6	6	6	8	4	10	5	1
8	M	69	110	14	44	30	3	5	12	4	2	0	1
9	M	78	110	29	39	10	2	6	4	0	1	1	2
10	M	71	119	30	36	6	3	8	23	14	14	7	1
11	F	76	117	27	33	6	5	7	26	15	6	3	2
12	F	72	112	30	49	19	5	7	10	5	3	2	1
13	F	69	99	30	41	11	1	7	23	9	9	3	1
14	F	71	110	30	50	20	3	8	6	6	1	2	1
15	F	73	104	30	44	14	5	8	8	4	8	5	2
16	F	72	80	26	40	14	3	8	7	4	6	2	2
17	F	75	117	28	51	23	7	5	10	6	8	3	2
18	F	76	110	26	33	7	4	4	8	3	1	0	1

AA-LV GROUP, Continued

(1) S	(2) Sex	(3) Chron Age Mo.	(4) I.Q.	(5) Vis Mem s.s.	(6) Aud Mem s.s.	(7) Diff A-V	(8) WADT Errors	(9) DTVP Score	(10) V-A IR	(11) Method DR	(12) A-V IR	(13) Method DR	(14) Order 1(V-A,A-V) 2(A-V,V-A)
"Incomplete" Subjects													
19	M	74	102	30	40	10	2	4	21	9	–	–	2
20	M	75	106	30	44	14	2	2	–	–	7	5	2
21	M	66	95	26	35	11	3	–	–	–	1	–	1
22	M	74	85	29	44	15	5	–	18	11	–	–	2
23	F	74	119	30	44	14	3	6	–	–	8	3	2
24	F	72	91	23	62	39	1	–	15	10	–	–	2
25	F	68	108	30	38	8	3	–	–	–	4	1	1
26	F	69	101	29	43	14	3	6	–	–	7	1	1
AV-AA GROUP													
"Complete" Subjects													
1	M	68	114	38	39	1	2	6	4	2	9	5	2
2	M	70	99	34	33	1	7	6	20	9	7	4	2
3	M	70	103	33	33	0	12	7	12	6	3	4	2
4	M	67	103	38	38	0	5	6	23	9	6	3	1
5	M	77	91	34	39	5	8	7	17	9	6	4	1
6	M	76	100	33	39	6	3	6	8	3	7	0	2
7	F	69	93	35	34	1	9	5	19	11	7	4	1
8	F	76	80	37	35	2	1	4	5	2	1	0	2

AV-AA GROUP, Continued

(1) S	(2) Sex	(3) Chron Age Mo.	(4) I.Q.	(5) Vis Mem s.s.	(6) Aud Mem s.s.	(7) Diff A-V	(8) WADT Errors	(9) DTVP Score	(10) V-A IR	(11) Method DR	(12) A-V IR	(13) Method DR	(14) Order 1(V-A,A-V) 2(A-V,V-A)
"Complete" Subjects, Continued													
9	F	71	104	33	35	2	7	7	24	12	6	4	2
10	F	73	93	38	35	3	6	6	12	3	6	5	2
11	F	68	97	38	33	5	4	7	19	9	10	6	2
12	F	76	120	39	38	1	7	7	17	8	13	4	1
13	F	73	97	34	38	4	9	7	27	12	15	6	1
14	F	74	100	37	38	1	3	8	22	8	9	3	1
15	F	65	102	37	34	3	4	7	21	13	11	7	2
16	F	67	116	35	35	0	5	6	16	9	5	2	2
17	F	66	119	34	39	5	4	6	11	3	12	6	2
"Incomplete" Subjects													
18	M	67	120	35	35	0	1	-	15	7	-	-	2
19	M	76	100	36	39	3	7	7	-	-	9	6	1
20	M	71	120	38	34	4	2	6	-	-	4	2	2
21	M	76	93	33	34	1	6	-	10	4	-	-	2
22	M	74	106	36	36	0	1	-	10	6	-	-	1
23	F	71	85	39	36	3	4	6	18	9	-	-	1
24	F	70	103	39	35	4	12	7	-	-	8	6	2
25	F	82	117	36	39	3	12	7	10	4	-	-	1
26	F	73	106	33	34	1	9	5	-	-	14	7	1

APPENDIX B

RAY READING METHODS TEST

RAY READING METHODS TEST

Experimental Form
Darrel D. Ray

INTRODUCTION

The reading literature is constantly emphasizing the point that all children do not learn to read at the same time nor do they learn in the same way. The teacher needs to know when a child is ready to read. The teacher should also be alert to the method of reading which will aid the child in learning to read with success.

The most appropriate approach to the selection of a suitable method of instruction is to evaluate the response of the reader to the process of learning to read. In analyzing the act of reading it is apparent that the mature reader uses a rapid visual recognition approach to trigger meaningful responses from material. However, in learning to read the learner will demonstrate a preference in the selection of recognition cues based upon visual or auditory learning modality strengths.

In evaluating methods currently available to the teacher, there appear to be four methods of reading instruction in use. These methods are Visual-Auditory, Auditory-Visual, Linguistic-Word Structure, and Linguistic Language Experience. The Ray Reading Methods Test is designed to evaluate the performance of children by measuring the response to teaching-learning experiences utilizing each of the four methods.

THE VISUAL-AUDITORY METHOD

The Visual-Auditory Method of reading instruction is currently the most widely used method. In the initial stage of learning the configuration of a total word is used for instruction with pictures and verbal context clues providing the vehicle of instruction. No sound-symbol associations are developed. The skill development program is dependent upon an accumulation of right words from controlled vocabulary reading material to be utilized later in an analytical approach to decoding. The transfer of decoding skills is delayed in general application, with the pace of skill development being slow. Learner strength requirements include: Vision (acuity, identification, discrimination, perception, memory) and Visual-Auditory Integration. The basal reader programs are most typical of the Visual-Auditory Method of reading instruction.

THE AUDITORY-VISUAL METHOD

The Auditory-Visual Method of reading instruction has the letter as the basic unit of instruction. Initially, the learner must accumulate a number of sound-symbol associations and use these in synthesizing, and thus decoding, words. Skill transfer is accomplished through use of known sound-symbol associations applied to unknown words. This transfer is effected early in learning to read and particularly early in words where consistent sound-symbol patterns exist. The pace of decoding skill development is rapid.

Learner strength requirements are primarily auditory (acuity, identification, discrimination, perception, memory) with a secondary strength requirement of auditory visual integration.

THE LINGUISTIC-WORD STRUCTURE METHOD

The Linguistic-Word Structure Method of reading instruction has the word pattern as the basic unit of instruction where letter names are taught and spelling patterns are accumulated. A learner generalized minimum contrast to decoding is used. Utilization of skill in early application is restricted to words having consistent spelling patterns and general application of skills in reading material is delayed. Since many memory patterns must be established, the pace of skill development is slow.

Learner strength requirements include: Vision (acuity, identification, discrimination, perception, memory) and visual-auditory integration. Most typical of this method is the Fries-Wilson material published by C. E. Merrill.

THE LINGUISTIC-LANGUAGE EXPERIENCE METHOD

The linguistically oriented Language Experience Method of reading instruction utilizes the meaningful structure of the learners' own language to provide the basic unit of instruction where the oral communication patterns of the learner are recorded as stories to be visually recognized. Basic decoding skills are primarily the anticipation of language units and the context of the material written. Since early material is provided by the learner, and his experiences, application of skills is early. Due to lack of vocabulary control, the skill development program is accelerated.

Learner strength requirements include: Language skills, auditory memory, and auditory-visual integration.

DIRECTION FOR TEST ADMINISTRATION

General Directions:

As in any testing situation, the examiner should be thoroughly familiar with the test materials and comfortable in the testing situation.

Before the Ray Reading Methods Test is administered, the examiner should accumulate testing material to include:

1. Basic data for the child.

2. Pupil Record Form for the Ray Reading Methods Test.

3. Materials for each of the four methods to be presented.

   a. Visual-Auditory
      10 word cards and one copy of story book for each child.

   b. Auditory-Visual
      6 isolation letter cards
      10 word cards

   c. Linguistic-Word Structure
      8 letter cards
      10 word cards

   d. Linguistic-Language Experience
      Toy horse
      blank cards and paper

4. This manual.

To insure optimum soccess with the instructional methods presented, the examiner provides the following:

A. A grouping of six desks arranged in an arc facing an area which allows for examiner movement.

B. A chalk board and/or a chart tablet.

C. A room free from distractors.

D. A felt pen.

DIRECTIONS FOR RECORDING

General Directions:

1. A plus is used after words the child has retained when tested after 20 minutes, 60 minutes, 24 hours, and 72 hours.

2. A minus is used after the words the child does not know.

3. Mispronounced words should be recorded phonetically in the blank to the side of the word.

4. The raw score is the total number of correct responses.
   a. For the first period, the possible score is 5.
   b. For the second period, the possible score is 10.

First Period:

1. If the child's raw score on the 24 hour test is three or more, proceed to the second instructional period of the method.

2. If the child's raw score on the 24 hour test is less than three, discontinue the test and proceed to the next method.

Second Period:

1. If the child's raw score on the 24 hour test is seven or more, the Prognosis Test has been completed. A score of seven or more indicates that the child is predicted to be successful in this method.

2. If the child's raw score at the end of the 24 hour period is less than seven, proceed to the next method.

GROUP ADMINISTRATION: SPECIFIC DIRECTIONS

FIRST SESSION: (20 to 30 minutes) ESTABLISHING RAPPORT

In providing a satisfactory teaching-learning experience for a group of four-five-six year old children, it is necessary to develop a working relationship through the use of oral communication. Rapport can be established in a familiarization session of 20 to 30 minutes during which the examiner molds the group into a working unit through story telling, interest discussion, show and tell, and game playing.

SECOND SESSION: (20 to 30 minutes)

The second session is devoted to instruction in one of the four methods. The directions for each method are outlined below. The method utilized for the first instructional period should be selected by evaluating the strengths and weaknesses of the learner (see Readiness Record File Manual). Underlined instructions are to be read to the children. Although procedures for each method are outlined, the examiner should provide additional motivation where required.

I. Visual-Auditory Method (Materials: 10 word cards, story booklets)

First Instructional Period: First story in booklet. Words to introduce: look, see, Jack, run.

This story is about Jack. Jack is a boy about 6 years old. (Write the word Jack on the chalkboard.)

This word (frame the word) is Jack's name. What does the word say? (Have a child frame the word). (Show the word card for Jack). Jack's name is on this card. Whose name is on the card? Can we read the boy's name? (Draw attention to the word Jack on the chalkboard and to the word Jack on the card.)

(Using the story booklet, develop the concept of the title of the story "Jack" through picture discussion. In presenting additional words the procedure of writing on chalkboard, or chart, using the word cards and reading in the story should be followed. Children should read the title silently.)

Introduce Look. This word tells you what to do if you want to see something. (Introduce the word look, have three of the children frame the word.)

Review: "Jack", "Look"

Introduce Play. Do you like to play games? What games do you like to play? (Placing the sentence "See Jack play." on the chalkboard, frame the word play, then ask each child to read the sentences.)

Review: Jack, See, Look, Play

Introduce Run. When we are in a hurry to get to another place what do we do? (run). Sometimes when we play we run. (Using the sentence "Run, Jack, run." frame the word run and ask each child to read the sentence.) Review all words in isolation and in context. Read the story about Jack, first silently, then orally. Individually test word knowledge in isolation and context, at the end of 20 minutes, reteaching any unknown words. Individually test word knowledge, in isolation and in context, at the end of 60 minutes from the instructional period, reteaching any unknown word.

The Second Instructional Period

Review: Look, See, Run, Jack, Play

Introduce: Fluffy (a cat), Said, Come, and Ride

Said. We use a word in a story to tell us who is talking. That word is said. (Write the word on the chalkboard, frame, introduce card. Use the sentences "See Fluffy run," said Jack. "See Fluffy play," said Jack. Children should read silently, then orally. It is important that the examiner observes each child to determine actual participation.

Come. (Write the word on the chalkboard.) Jack wants Fluffy to do something. Jack wants Fluffy to come to him. This word tells us what Jack wants Fluffy to do. What is this word? (Frame and compare with word card).

And. (Show the picture of Jack and Fluffy.) Who is in the picture? Yes, Jack and Fluffy. What word did you hear between Jack Fluffy? The word is and. (Write word on chalkboard, show word card.) Read silently, then orally.

Ride. (Use the picture of Fluffy riding and print this sentence on the chalkboard: "See Fluffy ride," said Jack. Ask a child to first look at the picture, then read the sentence. Frame the word ride, compare with word card, then have children re-read the story of "Fluffy" and "Jack".)

Individually test word knowledge in isolation at the end of 20 minutes, 60 minutes, and 24 hours.

FIRST INSTRUCTIONAL PERIOD

Introduce List A	20 minutes	60 minutes	24 hours
look	test	test	test
see	reteach	reteach	begin
Jack	look	look	second
run	see	see	instructional
play	Jack	Jack	period
	run	run	
	play	play	

SECOND INSTRUCTIONAL PERIOD

Review:	20 minutes	60 minutes	24 hours
look	Test List A	Test List A	Test List A
see	Test, reteach	Test, reteach	Test List B
Jack	List B	List B	
run			
play			

Introduce List B

come
said
Fluffy
and
ride

TEST II. AUDITORY-VISUAL METHOD

	Letter Sounds.	List A		Letter Sounds.	List B
	m	mat	(long)	a	mate
	t	bat	(long)	0	bate
	b	mob			mobe
(short)	a	tot	Sound pattern		tote
(short)	0	tam	clue silent e		tame

First Period:

Present the picture letter cards of List A. Instruct in the consonant sounds of "m", "t", "b", and the short vowel sounds of "a" and "o" by having the subjects repeat the sound of the letters using the examiner's utterance as a model. Test the sounds in isolation. After

the letter sounds have been learned, present the List A words one at a time. Each subject should respond to each sound/symbol at least three times.

On the first word, it might be necessary to aid the subjects in synthesizing the word. The words should be sounded and then pronounced. (m-a-t mat).

Using the directions for scoring, record the raw scores for the 20 minute, 60 minute, and 24 hour periods. Re-instruct unknown and mispronounced sounds and words at the end of the 20 and 60 minute testing periods.

Second Period:

Introduce the silent e and explain the rule (when e is added to the end of the word, then the "a" and the "o" will say their names and the e will be silent). Present the "a" and "o" cards and teach the long sounds of each. After the subjects can make the long "a" and "o" sounds present the words in List B. Repeat the same procedure for instruction of List B, i.e. synthesizing m-a-t to pronounce mate. After the words in List B have been mastered, add List A words and re-instruct the words and letter sounds not retained.

Using the directions for scoring, record the raw scores for the 20 minute, 60 minute, 24 hour, and 72 hour periods. Re-instruct unknown and mis-pronounced words at the end of the 20 and 60 minute testing periods.

TEST III. LINGUISTIC-WORD STRUCTURE

Letter Names.	List A	Letter Names.	List B
d	din	e	dine
f	fin		fine
p	pin		pine
n	pan		pane
m	man		mane
a			
i			

First Period:

Present the letter cards "d", "f", "p", "n", "m", "a", and "i" to the child one at a time. Instruct him in the letter names. After the letter names are known, present the words in List A one at a time. Spell the word and say the word while pointing to each letter, having each subject repeat the process. (d-i-n spells din, etc.) Re-instruct the letter names and words as a new word is presented or needed.

Using the directions for scoring, record the raw scores for the 20 minute, 60 minute, and 24 hour periods. Re-instruct unknown and mispronounced words at the end of the 20 and 60 minute testing periods.

Second Period:

Introduce the letter "e". Add "e" to the letters presented in the first instructional period and review all of the letter names. Present the words in List B and repeat the same instructional procedure as for List A. When the words in List B are known, add the words from List A. Re-instruct any word not known. Contrast and rhyme may be used in instruction of ten words.

Using rhe directions for scoring, record the raw scores for the 20 minute, 60 minute, 24 hour, and 72 hour periods. Re-instruct unknown and mis-pronounced words at the end of the 20 and 60 minute testing periods.

TEST IV. LANGUAGE EXPERIENCE

List A	List B
Using four of the short sentences the child relates, select five words which will be tested in isolation.	Using four more of the short sentences the child has related, select five words which will be tested in isolation.

First Period:

Present the toy horse to the subjects for examination, encouraging each subject in turn to hold the toy and describe, name, and/or manipulate it. Develop a story using the language of the subjects. Every attempt should be made to have the story be more than simple description and each subject should contribute. The story should consist of no more than four sentences from which five words (List A) are selected for instruction and evaluation. The story should be recorded on the chalkboard or chart. The words are taught in context with each subject responding to each word a minimum of three times. The use of verbal clues and matching sentences, phrases, and words are also part of the instruction. When the child can read the sentence and match the words, present the five words in isolation using examiner constructed word cards.

Using the directions for scoring, record the raw scores for the 20 minute, 60 minute, and 24 hour periods. Re-instruct unknown and mispronounced words at the end of the 20 and 60 minute periods.

Second Period:

Continue the discussion of the toy horse, using the previous story and adding four additional sentences from which five additional words (List B) will be selected for instruction and evaluation. When the subjects can read the sentences and match the five new words, (Each subject should respond to each word a minimum of three times.), present the words in isolation. The ten words should be emphasized within the context. Re-instruct the unknown and mis-pronounced words. Test all ten words in isolation at the end of the instructional period using examiner prepared word cards.

Using the directions for scoring, record the raw scores for the 20 minute, 60 minute, 24 hour, and 72 hour periods. Re-instruct unknown and mis-pronounced words at the end of the 20 and 60 minute testing periods using the story written by the subjects.

VITA

Raymond Gerard McCarthy, Jr.

Candidate for the Degree of

Doctor of Education

Thesis: THE EFFECTS OF VISUAL AND AUDITORY MEMORY ABILITIES ON WORD RECOGNITION SUCCESS UNDER TWO TEACHING METHODS

Major Field: Educational Psychology

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Personal Data: Born in Jersey City, New Jersey, April 22, 1943, the son of Mr. and Mrs. Raymond G. McCarthy.

Education: Graduated from Ridgewood High School, Ridgewood, New Jersey, in June, 1961; received the Bachelor of Science degree from St. Peter's College in June, 1965, with a major in Natural Science; received the Master of Arts degree from Fairleigh Dickinson University in June, 1967, with a major in Psychology; attended New York University, St. John's University, and Paterson State College between September, 1967, and June, 1969, and completed graduate work in Psychology and Guidance and Counseling; completed the requirements for the Doctor of Education Degree at Oklahoma State University in July, 1971.

Professional Experience: Probation Officer, Bergen County Probation Department, Hackensack, New Jersey, 1965-1967; Secondary Science Teacher, Suffern Jr.-Sr. High School, Suffern, New York, 1967-1969; Instructor, Psychology Department, Rockland Community College, Suffern, New York, Fall, 1968; Psychologist Intern, Rockland State Hospital, Orangeburg, New York, Summer, 1969; Graduate Research Assistant, Department of Education, Oklahoma State University, 1969-1970; Instructor, Educational Psychology Graduate Extension Course, Oklahoma State University, Fall, 1970; School Psychologist Intern, Bi-State Mental Health Foundation, Ponca City, Oklahoma, 1970-1971; appointed a school Psychologist with the Willingboro, New Jersey Public Schools, July, 1971.

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